THE LEGISLATIVE ASSEMBLY OF
BRITISH COLUMBIA

Protecting Drinking-Water Sources

Select Standing Committee on Public Accounts
Report

April 18, 2000

To the Honourable,
The Legislative Assembly of
the Province of British Columbia
Victoria, British Columbia

Honourable Members:

We have the honour to present the *Second Report* of the Select Standing Committee on Public Accounts for the Fourth Session of the Thirty-Sixth Parliament.

This *Second Report* covers the work of the Committee on the matter of **Protecting Drinking-Water Sources**. Respectfully submitted on behalf of the Committee.

Mr. Rick Thorpe, MLA
Chair

Ms. Evelyn Gillespie, MLA
Deputy Chair

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Composition of the Committee

Members

Rick Thorpe, MLA	**Chair**	*Okanagan Penticton*
Evelyn Gillespie, MLA	**Deputy Chair**	*Comox Valley*
Pietro Calendino, MLA		*Burnaby North*
Joy K. MacPhail, MLA *(from November 2, 1999 – April 3, 2000)*		*Vancouver-Hastings*
Glenn Robertson, MLA *(from November 2, 1999 – April 3, 2000)*		*North Island*
Erda Walsh, MLA *(from June 28, 1999)*		*Kootenay*
Rick Kasper, MLA		*Malahat-Juan de Fuca*
Steve Orcherton, MLA		*Victoria-Hillside*
Dennis Streifel, MLA (from April 3, 2000)		*Mission-Kent*
David Zirnhelt, MLA (from April 3, 2000)		*Cariboo South*
Gary Farrell-Collins, MLA		*Vancouver-Little Mountain*
Murray Coell, MLA		*Saanich North and the Islands*
Dr. John Weisbeck, MLA		*Okanagan East*
Jack Weisgerber, MLA		*Peace River South*

Clerk to the Committee

Craig James
Clerk of Committees and Clerk Assistant

Researcher to the Committee

Kelly Dunsdon
Committee Researcher

Terms of Reference

On April 3, 2000, the Hon. Dale Lovick moved that the following reports of the Auditor General of British Columbia be re-referred to the Select Standing Committee on Public Accounts:

- Report on the 1997/98 Public Accounts - Part I (November 1998)
- Report 4: A Review of the Estimates Process in British Columbia (February 1999)
- Report 5: Protecting Drinking-Water Sources (April 1999)
- 1998/99 Annual Report: Auditing in the Public Interest (June 1999)
- Report 1: Follow-up of Performance Audits/Reviews (May 1999)
- Report 2: Report on Government Financial Accountability for the 1997/98 Fiscal Year Parts II and III (June 1999)
- Report 3: Maintaining Human Capital in the British Columbia Public Service - The Role of Training and Development (August 1999)
- Report 4: Managing the Woodlot Licence Program (August 1999)
- Report 5: A Review of the Fast Ferry Project: (October 1999)
- Report 6: Forest Renewal BC - Planning and Accountability in the Corporation; The Silviculture Programs (October 1999)
- Report 8: Social Housing - The Governance of the British Columbia Housing Management Commission And the Provincial Rental Housing Corporation; The Management of Social Housing Subsidies (November 1999)
- Report 9: Pulp and Paper Mill Effluent Permit Monitoring; Standards of Conduct in the Education And Health Sectors; Status of Public Accounts Committee Recommendations Relating to Prior Years' Compliance Audits (November 1999)
- Report 10: Report on Government Financial Accountability For the 1998/99 Fiscal Year (Parts I and II) (February 2000)

and that the following report of the Auditor General of British Columbia be referred to the Select Standing Committee on Public Accounts for the first time:

- Report 11: Towards a More Accountable Government: Putting Ideas Into Practice (March 2000)

In addition to the powers previously conferred upon the Select Standing Committee on Public Accounts, the Committee be empowered:

(a) to appoint of their number, one or more subcommittees and to refer to such subcommittees any of the matters referred to the Committee;

(b) to sit during a period in which the House is adjourned, during the recess after prorogation until the next following Session and during any sitting of the House;

(c) to adjourn from place to place as may be convenient; and

(d) to retain personnel as required to assist the Committee,

and shall report to the House as soon as possible, or following any adjournment, or at the next following Session, as the case may be; to deposit the original of its reports with the Clerk of the Legislative Assembly during a period of adjournment and upon resumption of the sittings of the House, the Chair shall present all reports to the Legislative Assembly.

Introduction

Scope of the Audit

In March of 1999, the Auditor General released his fifth report to the Legislative Assembly for 1998/99, entitled *Protecting Drinking-Water Sources*. The report was the culmination of an audit conducted in 1998/99 which sought to determine whether British Columbia is adequately protecting its drinking-water sources from the impacts of human-related activities such as logging, cattle grazing, mining, outdoor recreation, transportation, agriculture and human settlement. As well, the audit examined the management of groundwater and small water systems in the province.

Your committee heard that the audit was carried out by:

- Studying provincial legislation, policies and assignment of responsibilities within government agencies;
- Studying the water systems of 8 British Columbia communities, representing a wide range of ecological conditions;
- Examining how the provincial government manages human-related activities in drinking-water source areas.

The audit did not address water treatment or distribution systems, as these issues are beyond the mandate of the Office of the Auditor General, and the Auditor General felt that the Provincial Health Officer had already done considerable work in examining these issues. Moreover, the audit did not examine the Greater Vancouver Regional District nor the Capital Regional District water systems.

In submissions to your committee, the British Columbia Medical Association and the British Columbia Tap Water Association expressed some concerns about the scope of the audit. In particular, the BCMA felt that there are still significant problems in the Vancouver and Victoria watersheds and, as such, they should have been covered by the review. Representatives of the BCTWA submitted that a review of the Vancouver and Victoria watersheds would have provided valuable information regarding the processes involved in restricting resource use activities on community watershed lands. However, in response to these concerns the Auditor General has emphasized that the exclusion of the Vancouver and Victoria water systems from the audit by no means indicates that these systems are trouble-free. Rather, because control over these drinking-water sources is relatively independent of the provincial

government, review of them would be beyond the scope of the Auditor General's role of examining issues under provincial management. Committee members certainly recognize the mandate within which the Office of the Auditor General must perform its work.

The Auditor General's review revealed that the province is not adequately protecting drinking-water sources from human-related impacts. Human-related activities can affect drinking-water quality by adding substances including:

- *Pathogens*: including fecal coliform bacteria, *cryptosporidium*, giardia – the presence of these in drinking water may cause diarrhea, vomiting and other intestinal difficulties;
- *Chemicals*: inorganic chemicals including arsenic, which may be discharged from semiconductor manufacturing or petroleum refining, as well as organic chemicals such as trichloroethylene, which may be discharged from petroleum refineries. Although not reviewed in the Auditor General's report, your committee also notes that substances such as "methyl tertiary butyl ether" ("MTBE"), a gasoline additive, may pose a threat to the quality of groundwater. Further discussion of MTBE is contained in this report at page 51;
- *Excess nitrates*: these are used in fertilizers, and are a major source of contamination for shallow groundwater aquifers that provide drinking water. Other sources of nitrate contamination are from septic system leaching, animal waste, plants, industrial and municipal wastes and internal combustion engine emissions. The Auditor General's report notes that high levels of nitrates can be especially dangerous for infants under the age of six months, as they interfere with the ability of the blood to carry oxygen.

In addition, committee members heard that human activities have other impacts on drinking-water quality, affecting the appearance and taste of water. These impacts include discolouration, odour, and turbidity (cloudiness). Turbidity may interfere with the ability to detect and treat certain problems present in water.

The Work of the Committee

The committee met in July and October 1999, and March 2000, to consider the Auditor General's report.

During the course of its deliberations, committee members received presentations from representatives of the Auditor General's office, and from representatives of government agencies with responsibilities impacting on drinking-water quality in British Columbia (the Ministries of Environment, Lands and Parks, Forests, Health, Municipal Affairs, Energy and Mines and the Land Use Coordination Office). Committee members also received written submissions from the cities of Kelowna and Prince Rupert, Union of British Columbia Municipalities, British Columbia Medical Association, British Columbia Water and Waste Association, British Columbia Tap Water Association and North Okanagan Water Authority.

Drinking-water Quality in British Columbia

In 1992, a report was released by the British Columbia Committee for Safe Drinking Water, a group composed of representatives from the Associated Boards of Health of British Columbia, the British Columbia Medical Association, the British Columbia Public Health Association, the Canadian Bar Association and the Canadian Institute of Public Health Inspectors. That report, entitled *Safe Drinking Water for British Columbia,* noted that in 1989 the incidence of waterborne disease in this province was 50% higher than the Canadian average for that year, and concluded that there is a lack of integrated planning and management of the province's drinking-water resources.

In 1996, outbreaks of cryptosporidiosis occurred in the cities of Cranbrook and Kelowna, causing widespread diarrheal illness and temporary "boil water advisories". *Cryptosporidium* is a small, single-cell parasite that may be found in the stool of wildlife and domestic animals, particularly cattle, and can infect the intestines of humans as well. The parasite is particularly dangerous for individuals with weakened immune systems. When in water, the parasite is contained in an egg called an "oocyst", which is highly resistant to environmental conditions such as cold weather or moisture. In 1993, an estimated 400,000 Milwaukee residents experienced similar illness during a cryptosporidiosis outbreak, which was thought to have been caused by runoff from a slaughterhouse. While the causes of the outbreaks in

Cranbrook and Kelowna have not been conclusively determined, there is evidence to suggest that high spring run-offs contributed to the outbreak by carrying the *cryptosporidium* parasite into the drinking-water supplies. Other British Columbia communities with a history of biological contamination in the water supply include Cassiar, Creston, Fernie, Kimberley, Kitimat, Lytton, 100 Mile House, Penticton, Rossland and West Trail, Chilliwack, Kamloops, Nakusp and Matsqui.

Financial Impacts of Poor Water Quality

In addition to the significant human costs involved, representatives of the Auditor General's office drew your committee's attention to the financial impacts that arise from failure to protect drinking-water sources. For example, during the 1996 outbreak of cryptosporidiosis in the Cranbrook area, the incidence of visits to doctors rose considerably, in conjunction with a rise in the number of confirmed cases of cryptosporidiosis confirmed by laboratory testing. As well, the Cranbrook Chamber of Commerce estimated that $5 million in business and tourism revenues were lost as a result of the outbreak.

It is also extremely time-consuming and expensive to rid water distribution systems of parasites once they are detected. For example, it has been estimated that the cost of flushing out Kelowna's system with heavily chlorinated water during the 1996 outbreak was approximately $300,000. Moreover, chlorination causes "trihalomethane" by-products. Studies have indicated that exposure to high levels of trihalomethanes, particularly chloroform, may increase incidences of certain types of cancer, although to date these studies have not provided conclusive proof of a relationship. In 1993, a trihalomethane guideline was incorporated into the *Guidelines for Canadian Drinking Water Quality*. Health Canada has stated that current evidence indicates that the benefits of chlorinating drinking water (reduced incidence of water-borne diseases) outweigh the risks of health effects from trihalomethanes.

Finally, your committee heard that if adequate steps are not taken to protect British Columbia's drinking-water sources, the costs of increased treatment required to deliver quality water to citizens will be significant. For example, the capital costs of installing filtration for the 100 municipalities outside Victoria and Vancouver currently using unfiltered surface water are estimated at $700 million.

If the costs associated with remediating contaminated water systems and increasing water treatment are to be minimized, better protection of British Columbia's watersheds is essential. As such, the Auditor General has made 26 recommendations to the provincial government which are aimed at improving the protection of drinking-water sources in British Columbia. The Auditor General believes that the province must take a layered approach to drinking-water protection, which combines source protection and an appropriate level of treatment, while at the same time recognizing the need to allow other activities to take place in watersheds.

Case Studies of Drinking-Water Sources in Eight British Columbia Communities

Representatives of the Auditor General's office provided your committee with information regarding eight community drinking water source case studies which were done as part of the audit. The eight case studies provide a snapshot of some of the issues faced by B.C. communities in their attempts to deliver quality drinking water to their citizens. In particular, the Auditor General examined the drinking-water sources of the cities of Fort St. John, Prince George, Williams Lake, Prince Rupert, Cranbrook, Kelowna, Abbotsford and Nanaimo.

In its submission to your committee, the British Columbia Tap Water Alliance expressed the view that the audit neglected key areas of the province such as the Sunshine Coast Regional District, which in May 1998 held a referendum on the future of logging in the watershed area. However, the Auditor General has noted that the case studies were chosen on the basis of regional representation and geographical factors as they relate to watershed management, as well as to reflect regional differences in Ministry of Environment, Lands and Parks and Ministry of Forests administration. The committee does recognize that there are many other communities throughout the province which are also experiencing challenges in the management of their watersheds.

Fort St. John

In 1997, Fort St. John began using a new groundwater source for its drinking-water supply. Because groundwater sources have layers of granular material which naturally filter out pathogens, Fort St. John's water source requires little treatment and is able to provide an abundant supply of water for the community.

Prior to 1997, Fort St. John's water was drawn from Charlie Lake, which suffered from high levels of harmful nutrients and fecal coliform bacteria as a result of agricultural activities and substandard sewage disposal. As well, there were problems with water odour and colour which filtration could not address.

Prince George

Unlike most municipalities in British Columbia, Prince George has been using groundwater as its drinking-water source since the 1960's. Your committee heard that most of this community's water comes from the Nechako River, and enters aquifers through layers of gravel and other material which act as natural filters to remove pathogens. However, despite the natural filtration process, the aquifers are shallow and highly vulnerable to surface contamination, and in fact a large spill of diesel fuel which occurred in 1997 continues to threaten one well.

Williams Lake

Like Prince George and Fort St. John, the community of Williams Lake also uses groundwater as its drinking-water source, although its source is deep and less vulnerable to surface contamination. However, because the city is located on the valley sides above the aquifer, the costs associated with pumping water up from wells is significant.

Prince Rupert

The community of Prince Rupert relies solely on surface water from two lakes in the area (Woodworth Lake and Shawatlan Lake), both of which are situated on Crown land. The watersheds are designated as a "community watersheds" pursuant to the *Forest Practices Code*. These sources are considered pristine, because access to the watersheds is limited by geographic factors and strict controls by city officials. While the surrounding vegetation does cause some discolouration of the water, and a higher-than-average acid content in Prince Rupert's water, the higher acid content serves to make chlorination more effective against *Giardia* and coliform bacteria.

Your committee received comments on behalf of the City of Prince of Rupert regarding the Auditor General's recommendations. Representatives of the city emphasized the protected nature of Prince Rupert's drinking-water source, and expressed the view that a general application of regulations across the province may not be an appropriate way to address source water protection and water treatment issues.

Cranbrook

Cranbrook's drinking water is drawn from the Joseph Creek and Gold Creek watersheds, and is stored in a fenced reservoir which helps to counteract turbidity by allowing sediment to settle out. However, during high runoff periods, turbidity increases, and at that time Cranbrook uses two wells as an alternate source of water for some areas. The city also plans to build a diversion so that turbid water can be bypassed around the system.

Unlike Prince Rupert's source of drinking water, access to Cranbrook's watershed is public, and representatives of the Auditor General's office noted that this community's drinking-water source faces a serious risk of parasites and other types of contamination. In particular, the serious outbreak of cryptosporidiosis in the area in 1996 raised concerns about cattle grazing on Crown lands in the watershed. Your committee heard that, while the City of Cranbrook has worked with the Ministry of Forests to fence cattle out of the area, they are still able to reach the streams that feed into the reservoir, and therefore there is still a high risk of contamination.

Kelowna

Although the City of Kelowna is served by five major water systems, the Auditor General's review focused upon the largest system, which draws water from Okanagan Lake through intakes located approximately 70 feet below the surface of the lake. Committee members heard that Okanagan Lake and its feeder watersheds are affected by a full range of human and animal activities, and as a result there are varying levels of pathogens present in the lake at all times.

Like Cranbrook, in 1996 the city of Kelowna experienced an outbreak of *cryptosporidium*. Due to the risk of future water-borne disease outbreaks, the city is currently considering a proposal to spend $44 million on improvements to its treatment and distribution.

Your committee was also made aware that on June 14, 1999, the City of Kelowna's Council unanimously passed a resolution which calls upon the provincial government to order the Ministries of Health, Municipal Affairs, Forests, Environment, Lands and Parks, Transportation and Highways, Energy and Mines, Agriculture and Food, as well as the Land Use Coordination Office and Environmental Assessment Office to implement the 26 recommendations of the Auditor General's recommendations. This resolution was submitted to the Union of British Columbia Municipalities

for consideration at its 1999 fall convention. That convention is discussed in more detail below in this report, at page 19.

Abbotsford

Groundwater from the Abbotsford-Sumas aquifer serves one-third of the city's population, while surface water from Norrish Creek supplies the remaining population.

However, the Abbotsford-Sumas aquifer is unconfined and highly vulnerable to contamination – in fact, in recent years two wells have been shut down due to elevated nitrate levels believed to be caused by inadequate septic tank systems and excessive use of manure and fertilizers. Further challenges include:

- the age of the system – because it is old, it requires frequent flushing and high disinfection levels
- nearby transportation routes, which pose a risk of chemical contamination
- rapid population growth in the area – due to this growth, there are concerns that the groundwater supply may not be adequate for future needs

The surface water source for the City of Abbotsford is also at risk from multiple resource uses, including logging and recreation. Your committee was advised that efforts to restrict access to the area have been ineffective. While chloramine is used as a disinfectant to control bacteria levels, it presents a hazard to fish if water treated with it were to escape into local creeks.

Committee members learned that the City of Abbotsford plans to address these problems by adding filtration, expanding the surface system to all parts of the city, and building facilities to pipe water from nearby Harrison River.

Nanaimo

Nanaimo receives its drinking water from the south fork of the Nanaimo River. Representatives of the Auditor General's office noted that the watershed is privately owned and logged, and access to it is jointly controlled by the City of Nanaimo and the logging company. While those wishing to fish or hunt are permitted access to the area, they must first purchase an access licence and watch a video which describes the rules and

responsibilities for protecting the watershed. There are, however, concerns about the future supply of water to the City of Nanaimo, as well as about low river flows in the late summer and fall which affect the fish habitat. As a result, it is expected that additional water storage facilities will have to be built in the future.

Integrated Management of British Columbia's Drinking-Water Sources

Currently in British Columbia, a multitude of provincial agencies conduct work which impacts upon drinking-water sources. Members of the committee were given an overview of the context of drinking-water source management in the province.

The committee was advised by representatives of the Auditor General's office that delivery of safe drinking water depends upon four levels of protection referred to as the "multi-barrier" approach, and that at each level various provincial agencies have some responsibility. The 4 levels of protection are as follows:

- Source water protection – source water protection is primarily the responsibility of the Ministry of Environment, Lands and Parks, the Ministry of Forests, landowners and local governments. However, the Ministries of Health, Energy and Mines, Transportation and Highways, Agriculture and Food, and Municipal Affairs, as well as the Land Use Coordination Office, also play roles. Source water protection was the focus of the Auditor General's review;
- Water treatment – water treatment is the primary responsibility of regional health authorities and water purveyors, although some responsibility also rests with the Ministry of Municipal Affairs and the Ministry of Environment, Lands and Parks;

Office of the Auditor General recommends that the Province:

1. Ensure that in integrated management processes dealing with drinking-water issues:
   - Drinking-water consumers and suppliers are meaningfully represented;
   - Decisions are grounded in sufficient reliable information about natural conditions in the watershed and the values and impacts of competing resource uses; and
   - Findings and recommendations are handed off to elected or appointed officials with the authority to act on them.
2. Designate within government a lead agency for drinking-water interests, to coordinate government policy and action on drinking-water issues.
3. Report annually, at both provincial and local levels, on its protection of drinking-water quality.
4. Issue a comprehensive set of guidelines for good drinking-water, so that decision-makers and citizens can better understand the information they receive about drinking-water quality.
5. Carry out a comprehensive evaluation of the rights of resource access of drinking-water suppliers, to determine if they are appropriate.

- Properly functioning distribution systems – construction, maintenance and operation of distribution systems is the responsibility of regional health authorities and water purveyors, although the Ministry of Environment, Lands and Parks also has some responsibility in this area;
- Monitoring/evaluation of water quality and health outcomes – monitoring/evaluation of water quality and health outcomes is the responsibility of regional health authorities, water purveyors, the Provincial Health Officer, the Ministry of Health, and the Ministry of Environment, Lands and Parks.

The roles of the various provincial agencies as they relate to protection of drinking-water sources are summarized in Appendix II to this report.

Representatives of the Auditor General's office noted that all fresh water in British Columbia belongs to the Crown, and therefore the provincial government has primary responsibility for the protection and management of drinking-water sources. However, the audit revealed that currently in British Columbia, the approach to protection and management of drinking-water sources is piecemeal, and there is a need for an integrated water-source management process.

The need for integration of drinking-water source protection and management has been recognized by the Environmental Protection Agency in the United States. As a result of amendments made in 1996 to the United States federal Safe Drinking Water Act, all states are now required to develop and implement "Source Water Assessment Programs" ("SWAP's"), based upon extensive inventory and analysis of existing and potential threats to the quality of drinking water. While many states have already implemented various water protection programs under the Act, the SWAP initiative aims to integrate local, tribal and state efforts into watershed frameworks, and focus them more on drinking-water concerns. As of August 1999, all states but one had submitted SWAP's for review by the Environmental Protection Agency.

Approaches to Integrated Land Use Management in British Columbia

The Auditor General has noted that the provincial government has tried various approaches to integrating water-source management in British Columbia. Those approaches are as follows:

- CORE Plans and Land and Resource Management Plans ("LRMP"): CORE is a strategic regional land use planning process initiated in 1992, but later replaced with the LRMP process. LRMP's are strategic plans covering smaller regions, and are coordinated by the Land Use Coordination Office. During the LRMP process, round-table discussions may occur to consider drinking-water sources where applicable. However, Land and Resource Management Plans have not been completed for the whole province yet;
- Integrated Watershed Management Plans ("IWMP"): the IWMP process was commenced before the Forest Practices Code came into effect in June 1995, and deals with planning within single watersheds. The Auditor General's report notes that, of the sixty watersheds originally earmarked for planning, only eight have completed plans, although your committee notes that recently a ninth plan was completed for the Haslam Lake and Lang Creek community watersheds in the Powell River area;
- Community Watershed Roundtables: a process established under the Forest Practices Code, community watershed roundtables gather information prior to the commencement of forestry activity, and advise on issues affecting particular watersheds

Representatives of the Auditor General's office told your committee that all of the approaches taken to integrated land use management in British Columbia to date have lacked one or more of the following essential elements:

- Meaningful involvement for all stakeholders, including drinking-water consumers and suppliers;
- Good information on the natural conditions in the watershed and the values and impacts of competing watershed uses (i.e. use of economic valuation techniques to determine the appropriate balance between resource uses and water treatment requirements);
- An effective mechanism for handing on recommendations to elected or appointed officials who have the authority to implement them.

Committee members were pleased to hear that an inter-agency "Directors' Committee" has been established to respond to the Auditor General's recommendations. The committee consists of directors from all provincial

ministries and agencies with responsibilities related to drinking water. The Ministry of Environment, Lands and Parks is chairing this committee and facilitating its work, and has signed a Memorandum of Understanding with the Ministry of Health. The committee has drafted a "Drinking-Water Action Plan" which aims to address the integration of drinking-water source management by dealing with issues such as:

- drinking-water regulations;
- management of non-point source water pollution;
- groundwater inventory and protection;
- pollution prevention programs;
- coordination of watershed stewardship and planning;
- water education/public awareness.

The Directors' Committee is expected to provide periodic progress reports to all affected agencies and provincial health officers, and to prepare a report at the end of two years to detail the progress made in implementing the Auditor General" recommendations.

As of early March 2000, the Directors' Committee had met 6 times in the prior 15 months, and considered issues such as a long-term drinking-water source protection strategy, the need for a "champion" to raise the profile of drinking-water issues in existing watershed management processes, detailed work plans, and prioritization of at-risk watersheds.

The relationship between the work of the Directors' Committee, its "Drinking-Water Action Plan" and the various recommendations made by the Auditor General is discussed in more detail throughout this report.

Stakeholder Involvement

The Auditor General's report states that representation of local drinking-water interests in existing land use planning processes has been inconsistent, particularly in strategic planning processes. During the course of its deliberations, your committee also received a submission from representatives of the City of Kelowna expressing concern about restricted resources curtailing the participation of Ministry of Environment, Lands and Parks staff in technical or planning meetings regarding water resource management.

Ministry representatives informed committee members that currently, local governments are often at the table in land use decision-making processes,

including LRMP's, and that announcements in local media provide opportunities for involvement from interested parties. However, there is recognition that miscommunications regarding opportunities to provide input into land use planning processes have occurred in the past, particularly with respect to the participation of regional health authorities. Therefore, the following initiatives have been undertaken:

- the Ministries of Health, Forests and Environment, Lands and Parks will survey LRMP processes where communication difficulties have been reported;
- Inter-agency Management Committees will be directed to involve regional health authorities in the LRMP process;
- Information will be prepared and distributed to all planning tables regarding the Auditor General's report and the need to address drinking-water sources in LRMP processes;
- The need to keep regional Water Management staff apprised of plans being developed, and of possible implications for drinking water in the planning area, will be emphasized;
- Two community-based watershed guidelines ("Guidebook to Watershed Management in B.C.", and "Tools for Managing Water Resources in B.C.") have been drafted to support community-led stewardship initiatives with respect to watershed management planning.

Natural Watershed Condition and Resource Use Information

The Auditor General's report notes that good resource management requires good information regarding natural conditions in watersheds, as well as the values and impacts of competing resource uses in watersheds. However, the audit revealed that there is currently a shortage of information on these important topics.

In response to the Auditor General's recommendations regarding information needs, the inter-agency Directors' Committee has developed two initiatives, to be led by the Water Management Branch of the Ministry of Environment, Lands and Parks. Firstly, the ministry will conduct a pilot project to map drinking-water supply areas on both Crown and private land that have not been designated as "community watersheds", so that such information can be available during integrated land use planning processes. Secondly, the ministry will improve integration and access to water data by identifying current information systems and issues, developing a new process to improve

data access and sharing among key agencies, and conducting a pilot project in late 2001/early 2002 to test and refine the process.

Committee members also heard that work is underway to improve communications regarding drinking-water sources not designated as "community watersheds" under the Forest Practices Code (which includes sources such as springs, lakes, watersheds exceeding 500 square kilometres, and watersheds located on private forest and other lands). For example, there are plans to improve data access and exchange between the Ministry of Environment, Lands and Parks and regional health authorities, and the Ministry of Health is developing a policy to assist regional health authorities in developing sanitary surveys of drinking-water sources.

Acting on Findings of Integrated Resource Management Processes

After examining the current resource management processes currently existing in British Columbia, the Auditor General concluded that it is important to ensure that recommendations and finding resulting from such processes are "handed off" to those with authority to act on them. He noted that, while CORE plans and LRMP's have resulted in such hand-offs, integrated watershed management plans do not have any implementation mechanism. Moreover, while community watershed roundtables conducted under the Forest Practices Code do make recommendations to Ministry of Forests district managers, those officials cannot act on advice from roundtables regarding activities not governed by the Forest Practices Code.

Representatives of the Ministry of Environment, Lands and Parks made your committee aware that the Directors' Committee has responded to the Auditor General's recommendation on this topic by developing plans to conduct follow-up with local governments through LRMP implementation and monitoring groups, and to review local governments' actions following the hand-off of completed plans. These initiatives, to be led by the Land Use Coordination Office, are expected to be in place by September 2000.

Designation of a Lead Agency to Protect Drinking Water

The Auditor General advised your committee that, in his view, designation of a lead agency to protect drinking-water interests should be a priority for the provincial government. In particular, your committee heard that a lead agency could support the integrated land use management process by contributing experience and technical knowledge, translating recommendations from the process into government action, coordinating the development of drinking-water policy and legislation, and collecting supporting information.

It is interesting to note that the United Kingdom established a "Drinking Water Inspectorate" in 1990. The main role of the inspectorate is to ensure that water companies in England and Wales supply wholesome water to consumers, and comply with requirements contained in the nation's water quality regulations. In this regard, the European Directive regarding drinking-water quality must be transposed into the United Kingdom's national laws by the end of year 2000. Many of the new standards, for example that regarding maximum allowable concentration of lead, are stricter than previous standards, and must be met by water suppliers by the end of 2003. The Regulator-General of the state of Victoria in Australia has also recommended that that jurisdiction establish a lead agency to protect drinking-water quality interests, along the lines of the United Kingdom's Drinking Water Inspectorate.

Representatives of the Ministry of Environment, Lands and Parks submitted to your committee that the Provincial Health Officer (and regional health authorities), in carrying out the responsibility of ensuring delivery of potable water to consumers, already perform a leading role as protectors of drinking-water interests in British Columbia. In particular, it was noted that the Provincial Health Officer, as required pursuant to section 3 of the *Health Act*, reports to the public and to government on the health of the citizens of British Columbia and health issues, including the state of drinking water in British Columbia. For example, the Provincial Health Officer's 1996 annual report contained a small section on drinking water, in which he recommended that the province implement a clean water strategy, including watershed management, ground water protection and water treatment.

However, the Auditor General has advised your committee that drinking water accounts for just a small part of what the Provincial Health Officer does. As such, the Auditor General emphasized to committee members that it is not desirable for protection of drinking-water interests to be handled as

part of an agency's broader mandate – rather, it must be the primary responsibility of one designated agency.

Support for designation of a lead drinking-water agency was also expressed to committee members on behalf of the City of Kelowna, Union of British Columbia Municipalities, British Columbia Medical Association, British Columbia Waste Water Association and British Columbia Tap Water Alliance. However, there were differing views regarding which agency would be most appropriate to take the lead on drinking-water issues. While the City of Kelowna was of the view that the establishment of a new "Watershed Agency" may be the best platform to address water issues, the British Columbia Medical Association stated that the existing Water Management Branch of the Ministry of Environment, Lands and Parks would be best-suited to fulfill this function.

Submissions from these organizations also contained concerns that, in order to be effective, any lead agency must have the independence, authority and resources to enable it to fill its role effectively, and must be established in consultation with stakeholders. For example, the British Columbia Medical Association has called upon the provincial government to provide "significant additional funding" to any agency designated as the lead in protecting drinking-water interests in the province.

Moreover, the Union of British Columbia Municipalities has pointed to the terms of the "Protocol on Principles for Shared Environmental Responsibilities", originally signed by UBCM and the Ministries of Environment, Lands and Parks and Municipal Affairs in 1993 (and renewed in 1996 and September 1999) as support for the requirement that local governments must be consulted prior to the establishment of a lead drinking-water agency. In particular, there is a provision in the Protocol stating that "any proposed significant change in environmental legislation, regulation, standards, policies or programs will be preceded by appropriate consultation among the affected parties, including timely notification of the proposed change". As such, in the fall of 1999 UBCM supported a resolution requesting that the province, *in consultation with local government* [emphasis added], establish a lead agency to ensure that drinking-water sources are protected when policy decisions are made.

In a written submission to the committee, representatives of the British Columbia Tap Water Association expressed the view that it is essential that any lead agency designated to protect drinking-water interests be independent of all resource use agencies in the province. The BCTWA also suggested that, once designated, a drinking-water agency should undertake a

comprehensive review of all provincial legislation which touches upon drinking-water source issues and resource use activities in community watershed areas. BCTWA felt strongly that any comprehensive review must include a public consultation process.

In responding to these concerns, it was the submission of the Ministry of Environment, Lands and Parks that the mandate given to the Provincial Health Officer pursuant to the *Health Act* is broad enough to allow that agency to act effectively as an independent protector of drinking-water interests in British Columbia. In particular, it was emphasized that section 3 of the Act empowers the Provincial Health Officer to make recommendations on legislative policy and decisions which are necessary to enhance public health, and ministry representatives pointed out that this includes policy and decisions regarding drinking water in the province.

Accountability Reporting on the State of British Columbia's Drinking-Water Sources

The Auditor General's report identified the need to improve accountability reporting on the state of drinking-water sources in British Columbia. The report contains a suggestion that the province work with local drinking-water suppliers to ensure that information is gathered and reported in a cost-effective manner.

In response to the concerns identified by the Auditor General, the Provincial Health Officer is expected to release a series of annual reports addressing drinking-water issues. Your committee has learned that these reports will contain information such as:

- water quality statistics and trends;
- a discussion of the Canadian Drinking Water Quality Guidelines;
- public perception of drinking-water issues;
- management of drinking water in the province;
- methods and limitations of source water quality protection;
- remediation and water treatment;
- comparative study of other jurisdictions;
- response to the Auditor General's recommendations;
- reports on specific regulated community water systems;
- Provincial Health Officer recommendations to the Legislative Assembly for changes to the management of drinking water.

It was emphasized to your committee that, in order to support the reporting process, all ministries participating in the Directors' Committee will be expected to share their resources and provide a considerable amount of information to the Provincial Health Officer. The first report of the Provincial Health Officer on the state of the province's drinking water is to be issued in the winter of 2000.

On a related note, your committee has learned that the Provincial Health Officer is proposing to make water quality data pertaining to all water systems available on the Internet, as well as to make the data available in hard copy for distribution by local health agencies.

Drinking-Water Guidelines

The Guidelines for Canadian Drinking Water Quality are developed jointly by a Federal-Provincial Advisory Committee on Drinking Water. A sub-committee meets on a bi-annual basis to review and, if necessary, revise the Guidelines. The Guidelines contain standards for microbiological, chemical/physical and radiological parameters, and specify maximum acceptable concentrations ("MAC's") for contaminants. MAC's are determined based on the results of long-term or lifetime studies, and special studies relating to reproductive hazards, genetic damage and carcinogenic potential. The MAC's contained in the Guidelines are far below exposure levels at which adverse health effects have been observed, and consumption of water containing contaminants at the MAC level is expected to have no negative impact on health.

The federal Guidelines have been incorporated into British Columbia's Water Quality Guidelines for Drinking and Recreational Water Uses. Responsibility for monitoring drinking-water quality at the tap is shared between regional health authorities and water purveyors in the province. When a serious problem arises, medical health officers in affected areas issue public advisories recommending that water be boiled prior to consumption.

However, committee members learned that only one of the Guidelines is a mandatory and legally-enforceable requirement in British Columbia. In particular, the Schedule to British Columbia's Safe Drinking Water Regulation enacted in 1992 under the Health Act contains microbiological standards for faecal coliform and total coliform levels in waterworks systems, but the remainder of the federal Guidelines are not legally-enforceable. In the course of his review, the Auditor General found that while the eight larger water systems he focused on during the audit

endeavoured to meet the Guidelines, smaller communities often choose to meet only the mandatory provincial coliform standard, perhaps due to the cost implications of achieving higher standards. The Auditor General believes that the provincial government should develop its own drinking-water quality guidelines to aid in the accountability of government and water purveyors. In particular, the Auditor General's report notes that the provincial Health Act already provides a mechanism for setting provincial standards or guidelines for tap water.

In most Canadian provinces, as in British Columbia, the federal Guidelines for Canadian Drinking Water Quality serve as recommendations only. Some provinces, such as Ontario, have developed their own guidelines or objectives based upon the federal guidelines, and including several additional parameters. On an international basis, other jurisdictions, such as some states in Australia, as well as New Zealand, have also chosen guidelines rather than legally-binding standards relating to drinking-water quality. In contrast, the province of Alberta enforces the federal Guidelines through its Potable Water Regulation (Alta. Reg. 122/93) passed pursuant to the Environmental Protection and Enhancement Act, R.S.A. 1992, c. E-13.3. Section 6 of that regulation requires that the physical, microbiological, chemical and radiological characteristics of potable water in a waterworks system must be maintained to meet, at a minimum, the limits for substances as set out in the latest edition of the federal Guidelines, as well as any additional limits established by the province. The province has also introduced new standards regarding protozoa in drinking water (i.e.) cryptosporidium cysts.

However, your committee recognizes that there must be a balance between the need to regulate and enforce drinking-water standards, and the need to contain treatment costs that could be incurred by water purveyors as a result of increased regulation. This has been evident in the United States, where in 1996 the Safe Drinking Water Act was amended to require the Environmental Protection Agency to finish developing comprehensive drinking-water quality regulations, including requirements for filtration treatment in surface water systems, disinfection treatment in groundwater systems, and standards for certain "priority contaminants" such as arsenic and cryptosproridium. Under the Safe Drinking Water Act, states are also allowed to set and enforce their own drinking-water standards as long as they are at least as protective as the federal standards.

It is interesting to note that the 1996 amendments have required that the EPA, when setting drinking-water standards, publish an analysis of whether the benefits of stricter regulation justify the costs of enhanced treatment.

For example, the EPA has estimated that its revised arsenic standard could result in total annual compliance costs of $2.1 billion. The American Water Works Association has estimated these costs at closer to $4.1 billion. A Drinking Water State Revolving Fund program has been established to assist water systems in financing infrastructure improvements to meet the standards contained in the regulations.

Your committee received submissions on this topic from the British Columbia Medical Association and the British Columbia Water and Waste Association. Both organizations expressed the view that the Guidelines for Canadian Drinking Water Quality should be converted into legally-enforceable regulations or legislation, with clearly-identified enforcement mechanisms. Representatives of the British Columbia Water and Waste Association further submitted that if the federal Guidelines are to be converted into regulations, significant funding must be made available to enable water purveyors to meet the legislated requirements.

Committee members were advised by representatives of the Ministry of Health that educational processes may go further in attaining better treatment and water quality than legislative requirements, and as such there are not any current plans to develop comprehensive tap water standards specific to British Columbia. Rather, the Ministry of Health is leading an initiative to develop policies which will provide improved direction and guidance to regional health units with respect to application of the federal Guidelines and, in particular, with respect to "boil water advisories", disinfections, waivers for disinfection, bottled water, potability, source water, and terms and conditions of operating permits. There are also plans to develop a due diligence report, to provide health authorities with guidance on their rights and obligations regarding enforcement.

On a related note, pursuant to the "Drinking Water Action Plan" which has been drafted in response to the Auditor General's recommendations, there are plans to:

- Improve the administration and enforcement of drinking-water regulations by improving compliance with the Safe Drinking Water Regulation. A September 1999 Status Report on the Drinking Water Action Plan indicates that this will be accomplished by working with water purveyors and industry to improve training and educational opportunities, and issuing Orders for non-compliance "where appropriate";
- Amend the Safe Drinking Water Regulation by introducing an E. coli standard, in addition to the current fecal and total coliforms standards,

to provide guidance regarding when "boil water advisories" should be issued;

- Amend the Sanitary Regulation under the Health Act to allow for more comprehensive management of groundwater sources of drinking water. Currently, the regulation imposes duties on dwelling owners and local health authorities to ensure a safe and potable water supply for domestic use, regulates the distance of wells from possible sources of contamination, and prohibits the deposit of refuse and unpurified sewage into streams. A first draft of proposed amendments has been circulated to health authorities for comment, and a second re-draft is underway.

Rights of Drinking-water Suppliers

In British Columbia, the Water Act governs licences to construct and operate waterworks, or to store, divert or use a specified maximum amount of water for particular purposes. However, the Act does not apply to groundwater, and according to the Auditor General does not reflect the long-term nature of drinking water suppliers' needs.

In the course of his audit, the Auditor General found that there is a need to review the resource access rights accorded to water suppliers pursuant to the Water Act, as the rights currently enjoyed by drinking-water suppliers lack some of the protections afforded to other resource licensees. In particular, the eight case studies conducted by the Auditor General indicated that, from one community to the next, there is a patchwork of inconsistent rights and responsibilities regarding drinking-water source protection.

The Auditor General has also suggested that the introduction of statutory rights of compensation to water suppliers for water source contamination caused by human activities may provide a better balance of rights and responsibilities of drinking-water suppliers, and encourage appropriate protection of drinking-water sources.

The Auditor General's recommendation on this topic received support from the Union of British Columbia Municipalities, British Columbia Medical Association, City of Kelowna and British Columbia Tap Water Alliance. In fact, at its 1999 fall convention, the Union of British Columbia Municipalities supported a resolution calling on the provincial government to take legislative action to ensure that drinking-water users and suppliers have tenure rights, and financial and liability protection.

Representatives of the Ministry of Environment, Lands and Parks advised your committee that a working group within the inter-agency Directors' Committee has been created to consider the issue of drinking water suppliers' resource access rights. A report reviewing the statutory and common law rights of resource access of drinking-water purveyors is currently being drafted, in consultation with the Union of British Columbia Municipalities, and this report will form the basis for developing future policy options.

Management of Human-Related Activities in Drinking-Water Source Areas

In the course of his audit, the Auditor General examined how well the province is managing human-related activities in drinking-water source areas. In particular, the audit focused upon the management of forestry, livestock grazing, outdoor recreation, transportation, agriculture, human settlement (septic tank systems) and mining. Other activities which may impact upon drinking-water quality were also briefly discussed in the Auditor General's report and by your committee.

Your committee heard that the Auditor General and government agencies with responsibilities affecting drinking water all agree that, while the protection of British Columbia's drinking water is an important objective, it must be balanced with the need to protect economic and social activities which benefit the province.

As well, representatives from the Ministry of Environment, Lands and Parks emphasized to committee members that, of the twenty-eight waterborne disease outbreaks referred to in the Auditor General's report, only three were actually linked to human activities. The other outbreaks were linked to wildlife, which is a major source of drinking-water contamination. As such, ministry representatives expressed their view that more stringent land use restrictions may have limited success in preventing waterborne disease outbreaks.

Office of the Auditor General Recommends that the Province:

6. Implement, as soon as possible, the requirements of the Forest Practices Code to have certain key examinations and judgments done by licensed professionals.
7. Determine whether it has sufficient specialists on staff to support its approval processes for forestry operational plans appropriately.
8. Examine and regularly report on both priorities for on-site inspections of operations in community watersheds and the frequency of inspections actually carried out.
9. Develop water quality objectives for all community watersheds as a matter of priority, if such objectives are to remain the main legislated mechanism for results monitoring under the Forest Practices Code.
10. Clearly assign responsibility for monitoring whether water quality objectives are being met, at all stages of forest development within community watersheds.
11. Give consideration to widening the range of results-based monitoring in community watersheds required under the Forest Practices Code.

Representatives of the Auditor General's office explained that the main threat posed to water by forest development activity is increased turbidity (cloudiness). Because forest cover acts as a purifier, logging activities impact on water quality by increasing the amount of water and silt that run through a watershed and into streams. Increased silt can interfere with water treatment processes that are intended to kill parasites present in the water supply.

However, a substantial portion of the forest harvest in British Columbia comes from areas which are designated or used as community watersheds. For example, in the Kootenays approximately 40% of the forest harvest comes from such areas.

THE FOREST PRACTICES CODE

The *Forest Practices Code of British Columbia Act* was enacted in 1995, and regulations pursuant to it developed by a committee composed of representatives from the Ministries of Health, Environment, Lands and Parks, Forests, Employment and Investment, and Agriculture. The Code regulates forestry, silviculture and range activities on Crown land by imposing operational planning requirements, but does not apply to forest development activities occurring on private land.

The Code and its regulations define and list community watersheds, and include special provisions for "water quality objectives" and monitoring in those watersheds. The majority of water quality objectives have been designed primarily for the benefit of fish and wildlife. However, in community watersheds where water is primarily for human consumption, more stringent forestry practices must be followed and water quality objectives are set which relate to the suitability of the water for human consumption (e.g.) by setting standards with respect to turbidity, fecal coliforms and nitrates.

The Operational Planning Regulation under the Code establishes procedures for watershed assessment prior to the commencement of forest development in a community watershed, and every three years thereafter. Exemption from the requirement to conduct a watershed assessment may be made if the district manager and designated Ministry of Environment, Lands and Parks official are satisfied that the volume of timber involved would not affect the watershed in any significant way. A forest development plan within a

community watershed must be approved by the district Ministry of Forests manager and a Ministry of Environment, Lands and Parks official.

The Ministry of Forests also publishes a Community Watershed Guidebook, which describes both the administrative and operational requirements for forest development in community watersheds, including the creation of forest development, silviculture and range use plans, watershed assessment procedures, and water quality monitoring. The guidelines contained in the Community Watershed Guidebook are not legally-binding.

Representatives of the Auditor General's office advised your committee that, while the Code gives extra protection to community watersheds located on Crown land where logging takes place, currently there are gaps in the application of the Code which limit its effectiveness. For example, numerous problems were drawn to committee members' attention. Those gaps are as follows:

Forest Practices Code Provisions Not in Force

Committee members heard that some of the provisions in the Code requiring that information-gathering and hazard assessment be conducted by licensed professionals are not yet operational. In particular, the Code specifies that where forest development plans are being prepared regarding development in community watersheds, hazard evaluations must be conducted by licensed professionals. Hazard evaluation involves two processes:

- terrain stability hazard mapping, which locates problem areas;
- terrain stability field assessments, which are mandatory where terrain has been identified in a forest development plan as unstable or potentially unstable, having a moderate or high likelihood of landslide, or having slopes of greater than 60%.

However, the hazard evaluation requirement is not mandatory in all community watersheds until June 15, 2000, and the Auditor General's report noted that in fact hazard evaluations have been carried out by individuals with practical experience but no professional designation. The report emphasized the importance of having these evaluations conducted by licensed professionals, who can be held legally accountable for the quality of their work.

A submission received by your committee from the British Columbia Water and Waste Association pointed out that although June 15, 2000 is drawing near, there may be a shortage of professionals with the required designations to perform hazard evaluations. However, representatives of the Ministry of

Forests have advised that they do not expect the availability of qualified registered professionals to be problematic. Ministry representatives also emphasized that despite the fact that individuals with no professional designation have been performing hazard evaluations, since December 1998 terrain hazard mapping has been required to be supervised and signed-off by qualified registered professionals. As of March 2000, most mapping was completed. Moreover, ministry representatives advised that ground level terrain stability field assessments must be carried out by qualified registered professionals.

Lack of specialist support for staff reviewing and approving forestry operational plans

The Auditor General's review also disclosed that government decision-makers may not always have the expert assistance they require when reviewing Forestry Operational Plans, which include highly technical watershed assessments and hazard evaluations.

The Auditor General's report emphasizes the difficulty in obtaining specialists to assist in interpreting these documents.

Need to Examine and Report on Priorities for On-site Inspection

It is the responsibility of the Ministry of Forests to ensure that the terms contained in forestry operational plans are being complied with. This is done by performing risk assessments and developing appropriate plans for on-site inspections. However, in his review the Auditor General found that not enough information was available to determine whether on-site inspection of logging sites that could affect drinking water were being carried out according to inspection plans.

In response to the concerns identified by the Auditor General, the Ministry of Forests has commenced a review of its compliance and enforcement which is expected to be completed by March 31, 2001.

Water Quality Objectives have not been set for all community watersheds

Various regulations under the Code provide that forest development and range practices must not cause water quality in community watersheds to fail to meet water quality objectives. Water quality objectives are site-specific limits set by the Ministry of Environment, Lands and Parks to protect all uses of a body of water, including recreation, wildlife, irrigation,

livestock watering, aquatic life or drinking water. Water quality objectives relate only to "community watersheds" as defined in subsections 41(8) and (10) of the Forest Practices Code of British Columbia Act. In subsection 41(8), "community watersheds" are defined as watersheds of streams or rivers, where water use for human consumption is licensed under the Water Act for a waterworks purpose, or for a water users' community, and where the watershed is smaller than 500 square kilometres. Subsection 41(10) contains a method by which watersheds not falling within the definition in subsection 41(8) can be designated "community watersheds" under the Code.

There are approximately 450 Code community watersheds in British Columbia. Initially, water quality objectives were to be developed for every community watershed, but when the Auditor General's review was done, it was revealed that more than 400 watersheds still required that such objectives be set.

Your committee also received a submission on this topic from the British Columbia Medical Association. The BCMA expressed its concern that, although water quality objectives set out in the Forest Practices Code have been designed based on the most sensitive use for each particular watershed, such objectives should not be relied upon in determining drinking-water quality because the Code was not designed with the primary objective of protecting water for human consumption purposes.

In an effort to respond to the concerns identified by the Auditor General, the Ministry of Environment, Lands and Parks has refined its traditional process for setting water quality objectives for community watersheds, and has developed an electronic template for use of regional staff. As well, a new "streamlined" approach for developing water quality objectives in watersheds with excellent watersheds has been drafted, which will be implemented on a pilot project basis for one year. Water quality objective development training was held for 10 regional staff and their consultants in February of 2000. Targets have been set for the development of water quality objectives in community watersheds still requiring them. For example, it is expected that draft water quality objectives will be developed for six watersheds in the Southern Interior by April 2000.

Clarification of responsibility for monitoring attainment of water quality objectives; Widening the range of results-based monitoring in community watersheds

The Community Watershed Guidebook produced by the Ministry Forests suggests the following allocation of responsibility for monitoring compliance with water quality objectives:

- Prior to forest development, drinking-water suppliers should monitor water quality;
- During forestry operations, forest companies should monitor water quality and the Ministries of Forests and Environment, Lands and Parks should determine if water quality is being adversely affected.

However, your committee was informed by representatives of the Auditor General's office that there is currently no legislated assignment of responsibility for monitoring compliance with water quality objectives, and that clarification of respective responsibilities is required. In this regard, a submission from the British Columbia Water and Waste Association suggested that any agency designated as the lead agency in protecting drinking-water interests, as recommended by the Auditor General, be assigned this responsibility.

The Auditor General also advised committee members that the use of water quality objectives may not be entirely effective in determining the cause of watershed problems, or in preventing such problems from occurring in the first place. The Auditor General's report points to recent efforts by Forest Renewal BC to use measures other than water quality objectives to assess watershed restoration work funded by FRBC, and to monitor effectiveness of integrated watershed management plans. As well, your committee notes that the United States Environmental Protection Agency has expanded its measures to include parameters that are not currently included in BC's water quality objectives, such as channel characteristics, riparian vegetation and aquatic organisms.

In response to the concerns identified by the Auditor General, your committee was made aware that the Ministry of Environment, Lands and Parks and the Ministry of Forests have formed a committee to examine results-based monitoring in community watersheds. The committee plans to report on the feasibility of a broader range of results-based monitoring by June 30, 2000. As well, the Ministry of Forests plans to review its compliance and enforcement program.

Other Initiatives

On a related note, during the course of its deliberations your committee learned that there is an initiative underway to coordinate forestry land use practices with public health protection interests. Draft Memorandum of Understanding templates are being developed, and discussions will be taking place at the regional level regarding how to increase health authorities' involvement in operational planning for community watersheds, and when referrals to health authorities should take place during planning processes.

Forest Development Practices on Private Land

Although not specifically a topic of discussion in the Auditor General's report, your committee considered the impact on drinking water of logging in watersheds located on private land, or on private land adjacent to Code community watersheds.

In this regard, Ministry of Forest representatives advised committee members that a new *Private Land Forest Practices Regulation* has been enacted pursuant to the *Forest Land Reserve Act*. The regulation was drafted in consultation with the Private Forest Landowners Association, and comes into force on April 1, 2000. Some of the provisions in the new regulation address water quality and riparian management, and provide mechanisms for the resolution of disputes between water purveyors, private landowners, the Ministry of Environment, Lands and Parks, and the Forest Land Commission. However, the regulations only apply to land in the forest land reserve and to privately-managed forest land in the agricultural land reserve. Water quality issues arising from forestry activities taking place on other private lands are within the purview of other pieces of legislation administered by the Ministries of Municipal Affairs and Environment, Lands and Parks.

Livestock Grazing

If not properly managed, cattle-grazing may add sediment and parasites to drinking-water sources. In particular, young calves are more likely to spread cryptosporidium oocysts than are older animals. For example, one infected calf may shed as many as 10 billion cryptosporidium oocysts in a single day. However, ranchers rely on the availability of Crown land for livestock grazing. As such, there is a need to balance the interests of British Columbia's $700 million per year beef industry with drinking-water quality protection interests.

Office of the Auditor General recommends that the Province:

11. Expand the range provisions of the Forest Practices Code to more effectively address risks from parasites.
12. Consistently separate the responsibilities for developing range use plans and for enforcing them, or introduce compensating controls.

Forest Practices Code Range Provisions

The management of grazing in British Columbia's community watersheds is subject to regulations and guidelines under the Forest Practices Code. For example, the Code provides that:

- Livestock must be removed from Crown range in a community watershed, and not allowed to re-enter the watershed, if their previous use has caused the water quality to fail to meet water quality objectives;
- Livestock must not be allowed to use riparian areas of community watersheds, if the use would result in fecal deposits, trampling of vegetation or exposure of mineral soil to an extent determined by the Ministry of Forests district manager to be detrimental;
- Range developments in community watersheds must not be placed to encourage livestock use within 50 metres of a stream.

Furthermore, ranchers using Crown land for livestock grazing must do so within the terms of "range use plans" meeting the requirements contained in the Operational Planning Regulation, and approved by Ministry of Forests District Managers. The ministry also publishes a Range Management Guidebook to assist ranchers in development of the plans.

However, representatives of the Auditor General's office noted that, despite the requirements of the Operational Planning Guideline, the control provisions of the Code need to be expanded to adequately control the risks to drinking water posed by livestock grazing. As an example of these expanded

control measures, the Auditor General's report refers to actions taken by the Ministry of Forests in response to the 1996 cryptosporidiosis outbreak in Cranbrook. Those measures included amending the range use plan for the drinking-water source area to exclude calves from the watershed, and building a fence to keep cattle away from streams for two kilometres above the city's water intake.

Your committee notes that, in response to the Auditor General's recommendations, one of the work plans created by the inter-agency Directors' Committee states that "the range management framework of the Forest Practices Code is sufficient to prevent or minimize the introduction of parasites by cattle, and to deal with problems if they arise". However, more research is being planned to assess the interaction between range use, traditional ranching, wildlife and recreational activities as they impact on water quality. As well, regulatory amendments have been proposed to strengthen the Ministry of Forests' ability to require properly functioning riparian conditions with respect to cattle management.

Responsibility for Development of Range Use Plans

The Auditor General's report also noted that the effectiveness of range use plans is being weakened by unclear responsibility for their preparation and enforcement. In particular, the Auditor General found that although the Code does require Range Agreement holders to prepare Range Use Plans, there is little expertise outside the ministry on range use planning. Furthermore, Ministry of Forests district managers may grant exemptions from the requirement to develop Range Use Plans. When such exemptions are granted, ministry staff become responsible for preparing the range use plans. However, the Auditor General was of the view that it is not appropriate to have the same ministry staff who are responsible for preparing the plans also responsible for monitoring and enforcing compliance with them. He also noted that range use plans do not require professional sign-off, as do forestry operational plans.

Your committee has learned that a Range Use Plan streamlining committee consisting of Ministry of Forests and Ministry of Environment, Lands and Parks staff was formed in the spring of 1999. This committee has developed proposals relating to the structure of range use plans, and has made recommendations to more clearly separate the responsibilities of the Ministry of Forests and range licensees during plan preparation. As of March 2000, approval of this recommendation by a Joint Management Committee of the two ministries was pending, and a regulatory amendment is expected in late spring or early summer of 2000.

Outdoor Recreation

Outdoor recreation activities such as camping, water sports and all-terrain vehicle use may also pose a threat to drinking-water quality. However, representatives of the Auditor General's office explained that there is very little information currently available concerning the effects of outdoor recreation on drinking-water quality. As such, the Auditor General has recommended that the provincial government gather information to assist in future policy development.

Office of the Auditor General recommends that the Province:

14. Gather information on the impacts of recreation on drinking-water sources, as a basis for future policy development.

Committee members heard that the provincial government has responded to the Auditor General's recommendations by undertaking a joint study with Health Canada, the University of Victoria, the Capital Regional District and the City of Kelowna regarding the impacts of recreational access on drinking-water quality. Watersheds located on Vancouver Island and in the Okanagan Valley are being examined in terms of recreational access and changes in water quality, particularly with respect to parasites such as cryptosporidium and giardia. Information obtained from the study, which is scheduled for completion in September 2001, will assist with policy development regarding recreational access to watersheds used as drinking-water sources.

Transportation

Design and Construction of Transportation Routes

Because transportation routes are often located within areas that replenish underground water supplies, there is a serious risk that chemical spills and contaminated runoff may negatively impact both groundwater and surface water. Furthermore, the paved surfaces of transportation routes can hinder the natural return of water to aquifers. As a result of these potential risks, the Auditor General has recommended that the provincial government place priority upon planning and building transportation routes and infrastructure in ways which minimize water source damage, and

Office of the Auditor General recommends that the Province:

15. Give priority to planning and building transportation routes and infrastructure in ways that will prevent the degradation of drinking-water sources.

16. Continue to strengthen procedures to minimize damage to drinking-water sources from chemical spills and leaks, and to implement provisions to prevent wide-area (non-point source) contamination.

strengthen procedures to minimize damage to drinking-water sources from chemical spills and leaks.

Your committee was made aware that highway projects now employ management practices aimed at preventing degradation of drinking-water sources, and minimizing chemical spills and leaks. For example, a "Highway Environmental Assessment Process Manual" exists, with the purpose of increasing awareness regarding the environmental concerns surrounding highway development. The Ministry of Transportation and Highways plans to form a work group to review the manual, in order to determine if there are opportunities to highlight drinking-water issues. The Ministry also has an "Environmental Management Plan" and a "Referral Manual" in which the need to protect drinking-water sources from highway development activities will be specifically referenced.

Committee members were also interested to hear that the Ministry of Environment, Lands and Parks and the Ministry of Transportation and Highways have signed a Memorandum of Understanding which provides guiding principles to allow operational staff to develop regionally-oriented working agreements. There are plans to update that Memorandum of Understanding by October 27, 2000 to include a more specific reference to the risks posed to drinking water by highway spills, and to include procedures for spill response and spill reporting requirements under the Waste Management Act and the Health Act.

NON-POINT SOURCE CONTAMINATION

The Auditor General's report also points out that vehicle use can lead to chemical contamination over a wide area, through the release of trace metals (such as lead, cadmium, chromium and mercury), vehicle emissions, and the use of road salt. The Auditor General has therefore recommended that the province must implement provisions to prevent wide-area (non-point source) contamination.

Your committee has learned that the Ministry of Environment, Lands and Parks is leading an initiative to implement a Non-Point Source Water Pollution Action Plan which was issued in March 1999. The plan includes the following components:

- Education and training about the sources, risks and prevention of non-point source water pollution. In this regard, the Ministry of Environment, Lands and Parks plans to release a "Non-point Source Water Pollution Management Practices Compendium" to assist local

governments and industry in preventing and managing non-point source water pollution;

- Prevention at the site, by development and adoption of "best management practices" to be applied at the source, and establishment of water conservation programs;
- Land-use planning, coordination and local action, involving the identification of water quality protection strategies for all forms of land use, encouragement of local stewardship groups' participation in water quality protection, and development of organization structures and partnerships to coordinate efforts;
- Prioritization of watersheds for non-point source pollution control actions, implementation of regional pilot projects, assessment of effectiveness through monitoring, and reporting of results to stakeholders;
- Assessment of the potential for using market-based incentives to motivate non-point source water pollution prevention;
- Ongoing analyses of existing legislation to address weaknesses and gaps in existing law as necessary.

Your committee also notes that, as part of the province's Non-Point Source Water Pollution Action Plan, a local government Non-Point Source Committee has been formed. The first meeting of that committee was held in February 2000.

Agriculture

Nutrient-Loading

The Auditor General's report notes that "nutrient-loading" is the most significant threat to drinking-water quality in British Columbia. Nutrient-loading occurs when excess nutrients are produced by increased livestock density, and increased use of herbicides and fertilizers. Animal waste, herbicides and fertilizers enter the groundwater and degrade water quality, often resulting in nitrate levels above the maximum acceptable concentration specified in the federal Guidelines for Canadian Drinking Water Quality.

The problem of nutrient-loading has been particularly acute in the lower Fraser Valley where, according to 1986 Statistics Canada figures, approximately 75% of poultry, 72% of hogs, and 67% of dairy cattle in B.C. are located. A Fraser Valley Groundwater Monitoring Project was initiated in 1992 to look into the problem. During the course of this project, sampling of a total of 251 wells in the area, including 71 private wells and 180 community wells, was conducted by groundwater consultants, with the participation of the Ministries of Health, Environment, Lands and Parks, and Agriculture and Food. A report was issued in 1995, which indicated that there were elevated concentrations of nitrate-nitrogen in the Abbotsford, Hopington, and Brookswood aquifers.

Office of the Auditor General recommends that the Province:

17. Develop region-specific regulations for agricultural sources of nutrients.
18. Strengthen compliance with the Code of Agricultural Practice for Waste Management through more outreach efforts to encourage voluntary compliance by farmers.
19. Give priority to monitoring compliance with the Code of Agricultural Practice for Waste Management, and to enforcement actions that encourage compliance with the Code, in order to maintain the incentive for voluntary compliance.

The Columbia Valley, located southwest of Cultus Lake, is another area which has been subject to nitrate levels exceeding those contained in the federal Guidelines for Canadian Drinking Water Quality. Residents of the area organized the "Concerned Citizens' Group of Columbia Valley" to discuss concerns about local manure management practices, and a study of groundwater conditions in the area was conducted by the Ministry of Environment, Lands and Parks from 1997 to 2000. That study, the results of which were released in February 2000, revealed that two small areas within the Columbia Valley aquifer have experienced nitrate contamination, likely due to agricultural activities. A number of recommendations were made, including the recommendation that the spreading of manure be strictly avoided during the winter season (November 1 to January 31).

The Code of Agricultural Practice for Waste Management is in place to address the control of water contamination from agricultural waste. In particular, the Code provides that manure must be applied to land only as a fertilizer or soil conditioner, and that runoff must not be allowed to pollute surface water or groundwater. Unfortunately, the Auditor General's review revealed that compliance with that Code has not been widespread enough to address the nutrient-loading problem, and as a result agricultural nutrients have contributed to well-water contamination in the Fraser Valley and in areas around Armstrong, Osoyoos and Grand Forks. The Auditor General

believes that it is necessary for the provincial government to strengthen and monitor compliance with the Code, and to introduce region-specific regulations which will address local conditions, such as the nutrient-loading problem which is particularly acute in the Fraser Valley.

Agricultural Waste Management in Other Jurisdictions

Region-specific agricultural waste regulations have been implemented by the United States Environmental Protection Agency through its "Total Maximum Daily Loads" program.

As well, the Auditor General's report notes that the state of North Carolina has instituted a nutrient credit trading program in the Tar-Pamlico watershed. Like the lower Fraser Valley, the area is home to intense crop cultivation and livestock operations, and groundwater quality has suffered as a result of nitrogen and phosphorous loading. In 1989, the North Carolina Environmental Management Commission designated the Tar -Pamlico basin as a "Nutrient Sensitive Watershed", and the "Tar-Pamlico Nutrient Trading Program" was initiated shortly thereafter. Under the program, dischargers in the area have formed an association, and contribute funding for agricultural best management practices in order to achieve all or part of the total nutrient reduction goals established for member facilities. The dischargers' association has estimated that controlling one unit of source load with best management practices costs one-tenth as much as controlling the same load through use of wastewater treatment facilities.

It is also interesting to note that, in the United Kingdom, the 1989 Water Act contains provisions for the designation of "Nitrate Sensitive Areas (NSA's)" and the regulation of farming practices within those areas. In 1990, 10 small areas were designated as NSA's on an experimental basis. Farmers participating in the experiment received payments for the introduction of changes to agricultural practices and land use. The program was later expanded to thirty-two areas. As well, in 1991 the European Community introduced a directive requiring member states to designate nitrate vulnerable zones, and to take actions to introduce compulsory restrictions on the use of nitrogen fertilizers in those areas. As a result, sixty-eight such areas in the United Kingdom were designated as nitrate vulnerable zones.

Initiatives in British Columbia

In British Columbia, the Ministry of Environment, Lands and Parks, in consultation with the Ministry of Agriculture and Food, Agricultural Environmental Protection Council, federal Department of Fisheries and

Oceans, Environment Canada, and various commodity and producer conservation groups, has developed Manure Management Guidelines for the Lower Fraser Valley. The purpose of the guidelines is to facilitate compliance with the Code of Agricultural Practice for Waste Management by assisting agricultural producers in recognizing activities that, under certain conditions, have a high risk of violating that Code. The guidelines note that spreading manure during any high rainfall period is particularly risky, because the likelihood of contaminated runoff entering watercourses and groundwater contamination due to leaching is high. As such, the guidelines recommend that manure not be applied on land where runoff is likely to occur, on snow or frozen ground, or at rates that exceed the amount required for crop growth. Finally, the guidelines advise producers of the ramifications of non-compliance with the Code, such as Pollution Prevention Orders, ticketing or formal charges pursuant to the Waste Management Act.

Your committee was further advised that the Ministries of Environment, Lands and Parks, and Agriculture and Food, have been working with the B.C. Agriculture Council to develop a more comprehensive nutrient management plan for the agricultural sector. A "Ten-Point Action Plan" has been developed which aims to consolidate the consultation process, which is being facilitated by the Fraser Basin Council. A Partnership Committee, consisting of staff from the B.C. Agriculture Council and the ministries, has been formed to coordinate this work, and it is expected that the following options will be discussed:

- Limits to livestock densities;
- Movement of manure off the Abbotsford Aquifer to areas with soil nitrogen shortages (this option is already being introduced);
- Reduction in commercial fertilizer application, where practical;
- Improved nutrient management, including increased manure storage, improved manure application methods, rates and timing of application;
- Voluntary or mandatory nutrient management plans for all farms.

It is expected that the Fraser Basin Council will report back to the Partnership Committee by late fall of 2000, at which time a draft plan will be completed and taken to the public for comment.

Pesticides

Your committee also notes that certain conditions, such as permeable soil, vulnerable and unconfined aquifers, shallow water tables and high precipitation or irrigation, can increase the risk of groundwater contamination by pesticides.

A study conducted by Environment Canada in 1989 identified two areas within British Columbia where pesticides have been detected in groundwater. In the lower Fraser Valley, pesticides have been found in groundwater located in areas where strawberries and raspberries are grown. In the Okanagan Valley, where intense cultivation of grapes, berries and other fruit occurs, and where agricultural irrigation is used on a large scale, pesticides have also been found in groundwater. However, the study did determine that in most cases, levels of pesticides found in well water were well below the standards contained in the Canadian Drinking Water Quality Guidelines.

Human Settlement (Septic Tank Systems)

Jurisdiction over sewage disposal in British Columbia is divided between the Ministry of Health and Ministry of Environment, Lands and Parks. The Ministry of Environment, Lands and Parks regulates larger sewage treatment and disposal facilities through the new *Municipal Sewage Regulation* passed in July 1999 under the *Waste Management Act*. The new regulation encourages new waste treatment technologies to prevent water pollution.

The *Conditional Exemption Regulation*, also passed under the *Waste Management Act*, provides that the discharge of domestic sewage to a sewage disposal system that serves only a single or a double unit dwelling is exempt from the requirements of the Waste Management Act and its regulations. Regional health authorities regulate these small systems, including septic tanks, through the *Sewage Disposal Regulation* which has been passed pursuant to the *Health Act*.

Office of the Auditor General recommends that the Province:

20. Consider giving approving officers the authority to take into account the cumulative impacts of septic tank systems when examining subdivision proposals.
21. Determine whether there are areas of British Columbia in addition to the Okanagan Valley where nutrient-control provisions for septic tank systems could help reduce the need for investment in new drinking-water sources, or in higher levels of water treatment.
22. Complete and implement the proposal to help local governments develop maintenance bylaws for septic tank systems.

The use of septic tanks is common outside the major urban centres of British Columbia. Contamination of drinking-water supplies from phosphorus, nitrogen and bacteria contained in septic tank effluent has been a concern in some parts of the province, such as the Okanagan basin, where groundwaters with high levels of phosphorus have entered lakes used as drinking-water sources.

The Auditor General's report notes that the province's approximately 25,000 septic tank systems are more problematic than larger sewage disposal facilities, because they are more likely to be located upstream of drinking-water sources. Therefore, the focus of the Auditor General's review was the impact of these septic tank systems on British Columbia's drinking-water sources.

Cumulative Impacts of Septic Tank Systems

Representatives of the Auditor General's office explained that nutrients released by septic tank systems can accumulate in soil or groundwater, and over time may reach unhealthy levels, or encourage the growth of algae. As a result, water or waste treatment may become more expensive. It was drawn to the attention of your committee that this has been the experience in Lake Country, north of Kelowna, where nutrient-loading of the soil has necessitated construction of a Biological Nutrient Removal waste water treatment plant. Moreover, although it can be damaging to place new septic tank systems in areas which already have high nutrient levels, approving officers are currently only able to examine each proposed system in isolation, rather than the cumulative effects of all systems. Once approved and installed, there are no explicit requirements that septic tank systems be maintained properly.

The Auditor General's report explains that the negative effects of septic tank systems can be managed at four stages, which are as follows:

- During land-use planning;
- During subdivision approval;
- When a septic tank system is designed, approved and built; or
- During operation of the system.

Accordingly, the Auditor General has recommended that the provincial government introduce appropriate controls to manage the cumulative effects of septic tank nutrient release.

Numerous plans have been formulated to respond to the Auditor General's recommendation on this topic. A working group of the Ministries of Municipal Affairs, Health, Transportation and Highways and the Union of British Columbia Municipalities has been formed to consider regulatory and education measures to address the cumulative impacts of septic tank nutrient release. That group will examine options for changing the current regulatory framework, which consists of local government by-laws and provisions in the Municipal Act, Health Act (Sewage Disposal Regulation), Local Services Act

and Land Title Act. An interim working group report is expected in July 2000.

Although large sewage disposal and treatment facilities were not the subject of the audit, your committee also received information regarding the new Municipal Sewage Regulation which took effect on July 15, 1999. The regulation establishes a new framework consisting of minimum standards that must be met before municipal sewage facilities may obtain operating permits, and encourages new waste treatment technologies to prevent water pollution. The aim of the new regulations is to put forward a higher standard of treatment, not only to protect drinking water but also aquatic life in sensitive areas such as Baynes Sound in the Comox area. The new regulations also require that facilities applying for permits conduct environmental impact studies.

A multi-stakeholder Implementation Committee, consisting of developers, non-governmental environmental groups, industry associations, the Union of British Columbia Municipalities, consultants and representatives from three provincial ministries (Health, Municipal Affairs and Environment, Lands and Parks), and local governments has been created to oversee implementation of the new regulation. The guiding principles of the committee, as outlined in its Terms of Reference, are environmental effectiveness, clarity, cost-effectiveness and consistency. As well, a compliance strategy is currently being developed by the Ministry of Environment, Lands and Parks.

Nutrient Control Requirements

The Auditor General's report states that the Sewage Disposal Regulation under the Health Act does not adequately address the risk of nutrient accumulation posed by septic tank systems. While the regulation does contain a provision specifically designed to control nutrient accumulation in the Okanagan Valley, the Auditor General believes the province should consider whether nutrient-control provisions for other areas of British Columbia may also be required.

Maintenance of Septic Tank Systems

Your committee was also advised by representatives of the Auditor General's office that the province does not currently have any explicit maintenance requirements for septic tank systems. In this regard, the Ministry of Environment, Lands and Parks, in partnership with Environment Canada and the Ministries of Municipal Affairs and Health, has developed a draft "On-Site Model Maintenance By-law". A draft of the model maintenance by-law

has been reviewed internally, as well as by the Regional District of Comox-Strathcona. The aim of the model by-law is to provide local governments with a template for development of by-laws requiring homeowners to maintain on-site sewage systems. By-law pilot projects in some local governments will also be facilitated, and a toolkit is being developed to accompany the model by-law.

Mining Activities

The Auditor General's report also discusses the impact that mining activities can have upon drinking-water sources in British Columbia. In particular, exploration, operation and reclamation activities can add sediment and chemical contaminants to water sources.

Mining activities in the province are regulated by the Mineral Exploration Code. The Code took effect in May 1998, and was developed by a committee composed of representatives from the mining industry, labour unions, environmental groups, the Ministry of Energy and Mines, the Ministry of Forests and the Ministry of Environment, Lands and Parks. Section 11.5.2 of the Code specifies that an exploration access in a community watershed must not be located within a 100 metre radius upslope of a water intake, unless officials agree otherwise. That provision also requires that permittees ensure, in conducting mineral exploration activities, that such activities do not cause the quality of water to fail to meet water quality objectives established by the Ministry of Environment, Lands and Parks.

Currently, there are three approval processes that proposed mines are subject to:

- Large projects undergo formal assessments managed by the Environmental Assessment Office;
- Mid-sized projects are reviewed by Regional Mine Development Review Committees of the Ministry of Energy and Mines, in consultation with other ministries;
- Small projects are reviewed by local offices of the Ministry of Energy and Mines, in consultation with other ministries.

The Auditor General's report notes that, while regulations contained in the Mineral Exploration Code do control exploration in community watershed areas, they are too new for their effectiveness to be assessed. As such, the Auditor General has not made any recommendations regarding mining activities as they relate to the drinking-water sources in the province. In

this regard, your committee received a submission from the British Columbia Medical Association expressing concern about the lack of recommendations in this area.

Representatives of affected ministries and agencies advised committee members that the province is planning to improve communications with all stakeholders to ensure effective participation in the Regional Mine Development Review Committee process. The ministry is also conducting ongoing analyses of the effectiveness of practices and standards contained in the Mineral Exploration Code, particularly in the northern part of the province where there is a considerable amount of oil and gas exploration activity.

Oil and Gas Drilling Activities

Concerns were also raised from within the committee about how oil and gas drilling activities affect drinking-water quality in British Columbia. Representatives of the Ministry of Energy and Mines advised that these activities are regulated pursuant to the *Drilling and Production Regulation* which has been enacted under the *Petroleum and Natural Gas Act*, and administered by the Oil and Gas Commission. The regulation requires that certain procedures be followed during the course of drilling and seismic activities, including the following:

- as part of the pre-tenuring process, there is a review and inventory of resources done, and aquifer information that is known is documented;
- once drilling is commenced, mining companies are required to keep logs pertaining to the drilling area, which include parameters of geological formations, groundwater and any loss of circulated drilling fluids;
- it is common practice to have experts on site during the drilling stage of mine development, in order to ensure that there is no leakage into aquifers;
- private landowners are notified that drilling or seismic activity will occur on adjacent land;
- agreements are reached with private landowners to allow for drilling on private land;
- water quality sampling of well water prior to and following drilling or seismic operations is done, by agreement with the landowner.

The regulation also sets up a Mediation and Arbitration Board to resolve any disputes that may arise between drilling companies and private landowners.

The Oil and Gas Commission may also try to work with the parties to arrive at a solution.

Your committee was made aware that, over the course of the last two and a half years, there have been two documented cases of seismic or drilling operations resulting in contamination of groundwater, out of a total of 1500 drilling/seismic projects. However, your committee notes that because these activities did not take place on private land, neither the Mediation and Arbitration Board nor the Oil and Gas Commission had the authority to seek resolutions. In this regard, the Compliance and Enforcement Branch of the Oil and Gas Commission is conducting a review of alternatives that would allow resolution of issues falling outside the jurisdiction of the commission and the board.

Underground Storage Tanks

In the course of its deliberations, your committee also discussed the potential impact of underground storage tanks, particularly fuel storage tanks, on drinking-water quality in British Columbia. Because it is extremely difficult to remediate drinking-water sources that have been contaminated with petroleum products, prevention is the key to addressing groundwater contamination caused by fuel storage tank leakage.

Other Jurisdictions

To date, fuel storage tank leakage and its effects on drinking water have been more of a concern in other jurisdictions than in British Columbia. In December 1998, the State Auditor of California released a report stating that there is ample evidence that gasoline leaking from underground storage tanks is jeopardizing the safety of drinking-water supplies in the state. The Auditor recommended that state and local agencies provide better leadership in addressing contamination of groundwater by gasoline components and additives.

In particular, the presence of "methyl tertiary butyl ether" ("MTBE") in drinking water in the United States has prompted research and regulatory action. MTBE is an oxygenate, or "octane-enhancer", added to gasoline to improve fuel combustion and thereby reduce air pollution from car exhaust. The product has been used in the United States and Canada since the 1970's, and is produced in both countries. Because MTBE is very soluble and biodegrades relatively slowly, it moves through soil more quickly than other components of gasoline. The most common source of MTBE contamination

is from leakage of underground storage tanks, although contamination may also be caused by gas spills from motor vehicle accidents (particularly those involving tanker trucks), and leaks from pipelines and above-ground storage tanks. Tests on rats have determined that MTBE can cause cancer in animals, however its potential to cause cancer in humans is still being evaluated. Other health effects of MTBE ingestion may include headaches, eye, nose and throat irritation, cough, nausea, dizziness and disorientation.

MTBE contamination of public drinking water supplies has occurred in various parts of the United States, but particularly in California where, in the Santa Monica area, nine "high volume production wells" (those with daily water demand at approximately 6.5 million gallons per day) have stopped production due to contamination. Other areas of California that have experienced MTBE contamination of public drinking water include San Diego County, South Lake Tahoe, Santa Clara Valley and the Sacramento area.

An "MTBE Research Partnership" in California, composed of the Western States Petroleum Association, the Association of California Water Agencies and the Oxygenated Fuels Association has estimated the annual costs of treating drinking water containing MTBE for each family in the state. The partnership based its estimates upon three levels of contamination and three available treatment options (air stripping, ozone/hydrogen peroxide and granular activated carbon). Annual treatment costs ranged from $42 per family for the lowest contamination level and least expensive treatment option, to $391 per family for the highest contamination level and most expensive treatment option.

A 1998 University of California study recommended phasing-out the use of MTBE in gasoline over several years, and the assessment of alternative oxygenates such as ethanol, an alcohol. Since that time, the state has passed legislation requiring statewide testing, monitoring and reporting of the presence of MTBE in groundwater. The governor of California has also ordered that the use of MTBE be phased out by no later than December 31, 2002. As well, California has recently adopted regulations pursuant to its *Health and Safety Code*, setting maximum contaminant levels for MTBE. As of June 1999, twelve states had MTBE guidelines or levels in place.

At the federal level, in 1998 the United States Environmental Protection Agency ("EPA") established a panel of experts to evaluate the use of MTBE. Based on panel recommendations issued in September 1999, the EPA has labelled MTBE as a "potential human carcinogen", and has placed MTBE on its drinking water "Contaminant Candidate List" for further evaluation, to

determine whether it should be regulated under national drinking water regulations. In the meantime, the EPA has issued a "drinking water advisory" for MTBE of 20-40 micrograms per litre. It is also revising its "Unregulated Contaminant Monitoring Rule" to require large water systems (serving over 10,000 people) and a representative sample of small and medium systems to monitor and report MTBE levels. This requirement is to take effect in January 2001. Furthermore, in March 2000 the Clinton administration released a proposed legislative framework to encourage reduction or elimination of MTBE, and promote use of substances such as ethanol. The proposed legislative framework includes amendments to the *Clean Air Act* to provide authority to reduce or eliminate use of MTBE, and replacement of oxygenation requirements in the *Act* with renewable fuel standards.

British Columbia

Representatives of the Ministry of Environment, Lands and Parks advised that there have been few instances in British Columbia of water wells being contaminated by leaking fuel tanks. While this low occurrence rate may be attributable to the fact that the majority of drinking water in the province is obtained from surface sources rather than wells, the Auditor General's report notes that one-fifth of British Columbians depend on groundwater for their drinking water.

The British Columbia Contaminated Sites Regulation, enacted pursuant to the Waste Management Act, sets standards regarding the presence of gasoline in groundwater and soil, as well as prescribing remediation and reporting procedures. As well, the Ministries of Health and Environment, Lands and Parks have been promoting the development of emergency recovery plans throughout communities in British Columbia.

However, your committee notes that currently in British Columbia, there are no guidelines regarding the use of MTBE, or its presence in drinking water. Furthermore, no testing or monitoring of MTBE levels is currently taking place in British Columbia, although representatives of the Ministry of Environment, Lands and Parks have stated that the ministry is looking at options in this regard. At the federal level, progress has also been slow. While a national survey of MTBE concentration in groundwater was conducted by Environment Canada in 1993, as of late 1998 the results of the survey were still being reviewed. In a summary of its fall 1998 meeting regarding federal drinking water guidelines, the Federal-Provincial Subcommittee on Drinking Water noted that in fact little activity has taken place on the subject of MTBE since April 1998.

In the course of its deliberations, your committee also learned that, with respect to the construction and inspection of underground tanks and pipes, there is no legally-enforceable regulatory framework in place - only guidelines contained in Codes of Practice developed by the Canadian Council of Ministers of the Environment. In contrast, the City of Dayton is widely recognized in the United States and abroad for its innovative approach to groundwater protection. As part of a groundwater protection plan initiated in 1985, the city passed ordinances to phase out all underground storage tanks containing regulated substances other than vehicle lubricants and heating fuel over a 5-year period.

Groundwater Management

Groundwater aquifers are created, and replenished, when rainwater from the surface percolates through the soil. The percolation process helps to filter and purify the water. Groundwater may then be gradually released into rivers and surface soils, or may be tapped via wells.

Office of the Auditor General recommends that the Province:

23. Ensure regular monitoring of groundwater usage and levels in all developed aquifers across the province.
24. Ensure that monitoring of groundwater quality occurs regularly in all developed aquifers in the province, and more frequently in all vulnerable aquifers.
25. Establish a comprehensive and coordinated aquifer mapping and inventory program.

Committee members were made aware that although groundwater in British Columbia has traditionally been plentiful and of good quality, a disturbing number of sources in the province are now contaminated. In fact, your committee heard that in the Ministry of Environment, Lands and Parks' classification of approximately half of the province's aquifers, 10% were found to be contaminated such that they presented a health concern. Moreover, 8% of classified aquifers in the province are at risk of depletion due to heavy use.

Groundwater Mapping, Inventory and Monitoring

Representatives of the Auditor General's office advised your committee that, because half of the province's developed aquifers have not been mapped yet, there is a lack of knowledge which is hindering the provincial government's ability to manage and monitor the quantity and quality of groundwater sources. To date, approximately 300 aquifers have been classified according to level of use and vulnerability to contamination, and there is a network of 150 observation wells to monitor groundwater quality and level.

Based on the results of the audit, the Auditor General has recommended that the provincial government systematically monitor usage, levels and water quality of all developed aquifers in British Columbia, as well as monitor vulnerable aquifers on a more frequent basis. The Auditor General also believes that the provincial government must systematically collect and analyze information about British Columbia's aquifers, in order to begin the process of establishing an effective groundwater management system.

Ministry representatives advised your committee that, as of March 2000, 78 aquifers have been mapped, and mapping information provided to local

governments for the purposes of land use planning. The mapping program will continue into the fiscal year 2000/2001, during which time it is expected that 20 new aquifers will be mapped. As well, there are plans to add ten more observation wells in high-use aquifers by April 2001.

Lack of Groundwater Legislation

The Auditor General's report states that, despite the threats to the quality and quantity of British Columbia's groundwater sources, British Columbia is the only Canadian jurisdiction which does not have specific groundwater legislation. For example, the *Water Act* only applies to the extraction of surface water, and the Auditor General has stated that other provisions which seek to control transportation, agriculture and human settlement activities from having adverse effects on water sources are inadequate to prevent groundwater contamination. Furthermore, the watershed protection provisions contained in British Columbia's Forest Practices Code do not apply to groundwater sources, such as those of Prince George and Williams Lake. Considering that one-fifth of British Columbians (and up to 40% of the rural population) rely on groundwater as a drinking-water source, the effectiveness of the Code's provisions in protecting drinking-water sources in British Columbia is limited. Similar concerns were expressed in submissions received by your committee from the British Columbia Medical Association and the British Columbia Tap Water Association.

Groundwater Protection in Other Jurisdictions

Various approaches have been taken in other jurisdictions to protect the quality of groundwater sources. For example, in Sweden, where approximately 50% of the urban population uses groundwater, there is federal water legislation which has been in place since 1897, and which restricts land use within a specified distance of water wells. On the other hand, the approach in the United Kingdom has less formalized, with groundwater policy guidelines developed by the National Rivers Authority in a document entitled "Policy and Practice for the Protection of Groundwater". That document provides a classification of the vulnerability of groundwater to pollution based on a number of parameters. Vulnerability maps have been created to identify areas where groundwater resources require protection.

In the United States, almost 89 million people are served by community groundwater systems, and 20 million people are served by non-community groundwater systems. Many states, such as California, have developed

legislation to provide local governments with increased management authority over groundwater resources. The state of Oregon's Groundwater Quality Protection Act (1989) aims to prevent contamination of the groundwater resource by defining groundwater protection and listing statutory requirements. The legislation also provides for a groundwater protection program involving inter-agency coordination, statewide groundwater quality monitoring, domestic well testing, designation of groundwater management areas, development of best management practices, public education efforts, research projects and establishment of a groundwater information repository.

As well, the United States Environmental Protection Agency has implemented a "Comprehensive State Groundwater Protection Program". The aim of the program is to achieve a more efficient, coherent, and comprehensive approach to the nation's groundwater resources, to prevent contamination and to assist in setting priorities for prevention and remediation of groundwater. The EPA has also published a guidance document that assists states in carrying out the objectives of the program, by identifying strategic activities that form the key elements of the program. Strategic activities include the establishment of a groundwater protection goals and priorities, definition of roles and responsibilities, program implementation, information management, and public participation/education.

Amendments to the federal Safe Drinking Water Act in 1996 make grants available to states to develop and implement programs to coordinate protection of ground water resources within states. As well, the Environmental Protection Agency is required to establish a national "Ground Water Rule" by November 2000. The rule is expected to specify the appropriate use of disinfection, and encourage the use of best management practices and pollution prevention controls across the country. Processes are currently underway to analyze groundwater studies and to consult with stakeholders on this issue.

Some of the groundwater protection mechanisms used in Canada have been identified in a report on groundwater protection carried out by Golder Associates on behalf of Environment Canada in 1995 (project funding provided by the Fraser River Action Plan). Those measures include:

- Non-regulatory initiatives such as:
  - public education and awareness
  - water protection studies, mapping, inventory and classification, monitoring

- technical guidance for resource users and water purveyors, on a formal or informal basis – for example, in August 1997 the Ontario Ministry of the Environment announced a "Provincial Water Protection Fund", making sliding scale funding assistance available to municipalities to conduct groundwater management studies;
- land acquisition to acquire control land use for areas containing drinking-water sources, or purchase of development rights
- conservation easements
- encouraging development in less sensitive areas

- Measures that may be implemented through either regulatory or non-regulatory means:
  - Storm water and sewage control – including use of management plans, system design standards, regular inspection and maintenance, discharge permits, subdivision controls
  - Septic system controls – including use of site controls, prohibitions in sensitive areas, design controls, operational permits, regular maintenance and inspection programs, technical assistance and education programs
  - Agricultural controls – including employment of Best Management Practices, restrictions on chemical storage and use, pesticide/fertilizer application, agricultural activities in sensitive areas, provision of technical assistance and education programs
  - Transportation controls – designated transportation routes, restricting operation of vehicles carrying hazardous materials in proximity to drinking-water sources, training and education regarding emergency response, road and maintenance repair
  - Well-drilling and abandonment – guidelines/regulations regarding sites, construction, maintenance, well abandonment
  - Forest management – forest management planning, control of activities in and around streams, cutting restrictions, pesticide/herbicide controls, performance bonds
  - Market approaches – performance bonds, water use surcharges, penalties/fines for non-compliance, financial incentives through tax credits, grants and loans

- Regulatory measures:

- Zoning – including prohibitions of certain land uses and hazardous materials, designation of water source protection areas, large-lot zoning
- Facility siting, design and operation controls – using Best Management plans, siting restrictions, design, construction and operating standards, permitting and licensing, regular maintenance and inspection, contingency planning
- Hazardous materials restrictions – including control of the type and quantity of hazardous materials, controls on storage, handling and disposal, registration and tracking controls
- Underground storage tanks and pipelines – use of operations standards, permitting and fees, secondary containment, prohibitions in sensitive areas, and groundwater monitoring
- Above-ground storage tanks – operations standards, secondary containment, pressure testing, groundwater monitoring, permitting, fees, prohibition in sensitive areas
- Sand and Gravel Mining – security requirements, drainage controls, mining restrictions, prohibition in sensitive areas
- Permitting
- Inspection and Compliance

Representatives of the Ministry of Environment, Lands and Parks noted that groundwater legislation in other Canadian jurisdictions has not put other provinces ahead of British Columbia in terms of groundwater protection. For example, Ontario, which has groundwater legislation, is currently facing serious issues regarding groundwater sources in that province. Serious groundwater contamination has occurred in drinking-water sources situated in the towns of Elmira and Manotick. In 1989, it was discovered that the groundwater supply for the town of Elmira had been contaminated with a toxic chemical which had leaked from a local chemical plant. In 1991, 74 wells in the town of Manotick were found to contain a dry cleaning solvent that had leaked from a storage tank, and an alternate water supply had to be established. The costs of finding alternate water supplies were significant in both cases, and have resulted in groundwater protection initiatives such as the Regional Municipality of Waterloo Groundwater Protection Strategy.

However, your committee notes that a review of water policy and legislation in British Columbia undertaken by the Ministry of Environment, Lands and Parks from 1991 to 1993 resulted in the conclusion that there is considerable support for groundwater legislation in British Columbia. That review included regional and stakeholder consultation, and culminated in the release

of a report in 1993, entitled Stewardship of the Water of British Columbia: A Vision for New Water Management Policy and Legislation.

Representatives of the Ministry of Environment, Lands and Parks did advise your committee that groundwater legislation is currently being considered for the province of British Columbia, although it was emphasized that enacting such legislation would certainly not be the only solution to protecting the province's groundwater. Your committee also notes that, as part of its Freshwater Strategy for B.C., the Ministry of Environment has made the pursuit of groundwater protection legislation one of its 3-year priority activities.

Recent Government Action on Groundwater Management

Representatives of the Ministry of Environment, Lands and Parks informed your committee that, in response to the Auditor General's recommendations, the provincial government has been working within the current legislative framework to prevent groundwater deterioration. For example, the "Drinking Water Action Plan" includes the following initiatives:

- Mapping, classification and entry into the Ministry of Environment, Lands and Parks' database of an additional 50 aquifers by April 2000. A further 50 aquifers located in the Okanagan-Shuswap, Prince George, Cariboo and Peace River will be classified by April 2001;
- Addition of new observation wells in Belcarra, Prince George, Cache Creek and Oliver;
- Aquifer protection projects, including workshops on groundwater protection planning - to date, workshops have been held in Duncan, Whistler and Langley, and pilot project groundwater protection plans for Hornby Island and Grand Forks are in progress. Groundwater protection plans have been implemented and considered successful in other North American jurisdictions, including Dayton, Ohio and the Regional Municipality of Waterloo, Ontario, which initiated Canada's first comprehensive groundwater protection strategy;
- Development by the Ministries of Health, Environment, Lands and Parks and Municipal Affairs (in association with Environment Canada and the B.C. Ground Water Association) of a "Well Protection Toolkit". The toolkit is a six-step planning guide that aims to assist communities in developing plans for protection of groundwater sources. In this regard, your committee notes that the "Well Protection Toolkit" was released on February 25, 2000;

- Analysis of the Sanitary Regulation under the Health Act, to determine if provisions relating to groundwater and well construction issues can be expanded and re-worded to better address current issues. A draft analysis document has been circulated to health authorities for comment, and a second re-draft is underway based on the comments received.

Small Water Systems

The Auditor General's report notes that small water systems can be classified into two categories, as follows:

- Individual systems that supply a single property or household; and
- Community water systems that supply two or more connections, or have a single connection providing drinking water to the public.

Committee members heard that there are approximately 100,000 individual systems and 1,500 small community systems in British Columbia, most frequently located in rural areas where activities such as logging, agriculture and grazing are likely to impact upon water quality. The audit revealed that the owners/operators of small water systems seldom have the resources to do regular testing and preventive maintenance and, as a result, small water systems are sites of a high percentage of water-related health problems in British Columbia.

Office of the Auditor General recommends that the Province:

26. Ensure that any examination of the rights and responsibilities of drinking-water system owners considers the special circumstances of small system users.

In particular, the Auditor General advised your committee that small water systems operating in British Columbia face the following challenges:

- Many small water systems rely on small water bodies that are less able to absorb the impacts of human activities;
- Most small water systems do not qualify for provincial funding for capital costs of upgrades;
- Many small systems are too small to qualify for protection as community watersheds under the Forest Practices Code;
- Small systems that rely on groundwater, as well as many individual surface water systems, lack any assurance of rights to an ongoing supply via the Water Act.

Your committee also notes that the Safe Drinking Water Regulations under the Health Act do not apply to individual water systems supplying a single property or household. Therefore, the Ministry of Health and regional health authorities do not play any part in monitoring the quality of drinking water in these systems. However, the Ministry of Health will provide interpretive results to operators of individual systems who wish to have samples analyzed.

Because small water systems face technical, financial and managerial challenges that larger systems do not, the Auditor General concluded that the

provincial government must balance the need to protect small water systems with the need to ensure that small system owners take responsibility for providing the best system within their resources. The Auditor General has recommended that the provincial government ensure that any examination of the rights and responsibilities of drinking-water system owners include a consideration of the special circumstances of small water system users.

In response to the Auditor General's recommendations, ministries dealing with small water system issues have formed a partnership with the British Columbia Water and Waste Association and Environment Canada to prepare technical guidelines and manuals for operators of small water systems, and to sponsor educational seminars which address issues such as source water protection. The guidelines and manuals will be available in print form and on CD-ROM. There are also plans to improve access to information and educational materials concerning appropriate treatment options and the application of existing water quality guidelines, and to develop a waterworks system operators' certification program.

Furthermore, as part of the "Drinking Water Action Plan", the Ministry of Health is working with the Ministries of Municipal Affairs and Environment, Lands and Parks to devise incentives that would encourage the amalgamation of smaller systems with larger municipally-operated systems. For example, planning grants have been made available for studies of coordinated water treatment issues, through a committee consisting of ministry representatives. Eligibility for the grants is assessed based upon health and environmental criteria, and age of infrastructure.

However, representatives of the Ministry of Municipal Affairs emphasized to your committee that, in some cases, improved coordination between various water purveyors and suppliers operating within single municipalities or cities may actually circumscribe the need for amalgamation of smaller water systems. The City of Kelowna, which has five water purveyors, was cited as an example of successful coordination. Ministry representatives further stated that regional growth strategies provide a useful tool in assisting smaller communities to work together to examine areas of servicing that could be provided more effectively in a coordinated fashion. In this regard, your committee was pleased to hear that the Ministry of Municipal Affairs encourages local and regional governments' participation in the regional growth strategy process, particularly in high growth areas such as the Central Okanagan, Eastern Vancouver Island and the Lower Mainland. In fact, as part of the regional growth strategy planning process in the Central Okanagan, a workshop on watersheds, water quality and governance is being planned for the spring of 2000.

Public Education Initiatives

In the course of its deliberations, your committee was apprised of various drinking-water education initiatives that have taken place in British Columbia recently. Those initiatives include:

- Education and outreach regarding non-farm source pollution problems threatening water sources;
- Youth "E-teams" to educate the public about environmental issues, including drinking-water protection;
- "Water Crew" workshops in provincial schools, as part of an "Eco Education Program" sponsored by the Ministry of Environment, Lands and Parks;
- Water conservation education programs, in partnership with local associations and governments;
- Provincial government support of community stewardship groups, such as the British Columbia Lake Stewardship Society, which educate citizens about the protection of water sources;
- Water purveyor operation and maintenance manuals, and educational seminars.

Conclusion

Protection of British Columbia's drinking-water sources, both surface and groundwater, will require a long term integrated strategy which includes the development of work plans and time frames. In this regard, your committee is pleased to report that the inter-agency Directors' Committee currently has 29 work plans which list key deliverables and related timelines for implementation. A list of those workplans is attached to this report as Appendix III. The plans are intended not only to facilitate implementation of the Auditor General's recommendations, but also to go beyond those recommendations to form comprehensive drinking-water source protection strategies in cooperation with local governments and other stakeholders.

It is also apparent to your committee that an adequate information base is essential to the improved protection of British Columbia's drinking-water sources. This is reflected in many of the Auditor General's recommendations, which note the need for more information regarding the natural conditions of watersheds, the values and impacts of competing resource uses, as well as the need to establish comprehensive inventory, mapping and monitoring programs. As well, in a written submission presented to the committee by representatives of the Ministry of Environment, Lands and Parks on March 8, 2000, it is stated that "scientific uncertainty regarding the impact of land uses on water quality also affects the measures which can be justified to protect source waters".

In this regard, your committee is pleased to note that recently the University of Victoria has established Canada's first university-based research chair on the environmental management of drinking water. The new research program is headed by an internationally-renowned aquatic ecologist, and will evaluate the impact of watershed management activities, water supply operations, and changes in the food chain. Initial study sites are Victoria, Vancouver and the Cranbrook-Kimberley area, with plans to include other water utilities in the future. The program is being funded by the Natural Sciences and Engineering Research Council, local governments, the Ministry of Environment, Lands and Parks, Forest Renewal B.C. (Kootenay region) and some industry groups.

Committee Recommendations

1. **Your committee recognizes the importance of protecting drinking water sources and the high priority that British Columbians place on this issue. Accordingly, your committee recommends that the progress on the 26 recommendations made in the Auditor General's report "Protecting Drinking Water Sources" be reviewed and reported on every six months to the Select Standing Committee on Public Accounts.**

2. **Given the serious concern in the United States regarding ground-water contamination by the gasoline additive methyl tertiary butyl ether ("MTBE"), your committee recommends that the Ministries of Environment, Lands and Parks, and Health, examine the need for testing in British Columbia, and report back to this committee within twelve months with their findings.**

Appendices

I – Applicable Legislation, Guidelines, Plans

British Columbia

- *Waste Management Act*, R.S.B.C. 1996, c. 482: provides authority for the Ministry of Environment, Lands and Parks to issue pollution abatement orders and spill clean-up orders, and to regulate activities that have the potential of polluting surface and/or groundwater
  - *Conditional Exemption Regulation*, B.C. Reg. 201/94: divides responsibility regarding sewage disposal systems between the Ministry of Health and Ministry of Environment, Lands and Parks. Provides that the Waste Management Act and its regulations do not apply to sewage disposal systems serving one single or one double unit dwelling, nor to systems in which the total sewage flow is less than a specified quantity per day (and is not discharging into a surface watercourse or surface water body);
  - *Municipal Sewage Regulation*, B.C. Reg. 129/99: effective July 15th, 1999. Establishes minimum standards for effluent reuse and discharges to the environment by municipal sewage disposal and treatment systems, and requires municipalities constructing or upgrading sewage disposal and treatment systems to conduct environmental impact studies; also imposes design standards and monitoring requirements for sewage facilities.
  - *Agricultural Waste Control Regulation*, B.C. Reg. 131/92 (contains the "Code of Agricultural Practice for Waste Management"): regulates agricultural waste and its effect upon the environment by setting standards to prevent agricultural waste from adversely affecting watercourses. For example, the regulation provides that locations for feeding livestock, poultry or farmed game within a seasonal feeding area must be at least 30 metres from a high tide watermark, a watercourse or the bank of a watercourse unless written permission to the contrary has been obtained.
- *Water Act*, R.S.B.C. 1996, c. 483: applies to surface water only; governs licences to construct and operate waterworks, or to store, divert or use a specified maximum amount of water for particular purposes – focus is on control over quantity of water, rather than quality.

- *Environment Management Act*, R.S.B.C. 1996, c. 118: provides for minister's duty to prepare and publish environmental management plans for specific areas of the province which may include, among other things, water resource management; empowers minister to make environmental protection orders and to declare environmental emergencies.

- *Environmental Assessment Act*, R.S.B.C. 1996, c. 119: in effect June 1995; requires environmental assessments to be completed before large projects are commenced, including large groundwater withdrawals.

- *Forest Practices Code of British Columbia Act*, R.S.B.C. 1996, c. 159: the Act and its regulations apply only to Crown lands; regulates logging, road building, range use activities in Crown forest, including impact on "community watersheds"; defines and designates "community watersheds" to which specific guidelines in the "Community Watershed Guidebook" apply (see below); requires that strategic and operational plans be developed prior to certain activities taking place in community watersheds; establishes Forest Practices Board and Forest Appeals Commission
  - *Range Practices Regulation*, B.C. Reg. 177/95: regulates range development and practices on Crown land
  - *Operational Planning Regulation*, B.C. Reg. 107/98: outlines requirements for forest development, logging and range use plans, as well as silviculture prescriptions, riparian management, and notices of community watershed designations
  - *Forest Road Regulation*, B.C. Reg. 106/98: regulates forest road design, construction, maintenance and deactivation; requires soil erosion field assessments in community watersheds
  - *Timber Harvesting Practices Regulation*, B.C. Reg. 109/98: imposes requirements with respect to timber harvesting practices, including harvesting within community watersheds; requires timber harvesters to protect known community water supply intakes and infrastructures, and provides that harvesting must not cause the quality of water to fail to meet known water quality objectives; prohibits timber harvesting within community watershed where a terrain stability field assessment reveals that the area is subject to a high likelihood of landslides; regulates clearcutting within community watersheds
  - *Silviculture Practices Regulation*, B.C. Reg. 108/98: regulates practices such as felling or modification of trees in riparian reserve zones, reforestation, use of pesticides, silviculture surveys, and imposes a

requirement for soil rehabilitation plans where portions of forest have been disturbed by silviculture practices

- ➢ Community Watershed Guidebook (not legally binding): developed by a committee composed of representatives from the Ministry of Health, Ministry of Environment, Lands and Parks, Ministry of Forests, Ministry of Employment and Investment, Ministry of Agriculture and Food; consists of guidelines for the development of strategic and operational plans required pursuant to the Forest Practices Code of British Columbia Act when undertaking development activities (forest development, logging, silviculture, range use, road construction or recreational access) in community watersheds; also provides guidelines for monitoring the impact of those activities on community watersheds' water quality

- ➲ *Health Act*, R.S.B.C. 1996, c. 179: provides for the appointment of a Provincial Health Officer for the province, to report to the public on health issues; provides authority for regulations relating to, inter alia , the construction, maintenance, cleansing and disinfection of all drains and sewer systems, and the prevention of pollution of lakes, streams, pools, springs and waters; requires the appointment of local health boards and medical health officers

  - ➢ *Sanitary Regulations*, B.C. Reg. 142/59: prescribes duties of local health boards and medical health officers; imposes duty on owners of dwellings not connected to a waterworks system to provide tenants with safe and potable water for domestic purposes; prescribes minimum distances for wells from possible sources of contamination;
  - ➢ *Sewage Disposal Regulation*, B.C. Reg. 411/85: applies to on-site sewage disposal systems of single dwellings, double unit dwellings, and smaller sewage disposal systems (with estimated total sewage flows under 22.7 m3 per day); regulates construction and operation of smaller sewage disposal systems, including septic tank systems; establishes "environmental control zones" to which special requirements apply; administered by Ministry of Health and regional health authorities
  - ➢ *Safe Drinking Water Regulation*, B.C. Reg. 230/92: requires that water purveyors obtain operating permits, provide potable water to all users served by a waterworks system, and notify the medical health officer or public health inspector of any condition that renders or could render the water unfit to drink; requires water purveyors to monitor water quality and analyze samples for parameters specified by the

medical health officer or public health inspector; establishes microbiological standard for coliform levels.

- *Mines Act*, R.S.B.C. 1996, c. 293
  - Mineral Exploration Code, ("MX Code"): establishes standards for mineral and coal exploration and development in British Columbia, including requiring soil erosion hazard assessments for community watersheds within which exploration and development is to take place, and prohibiting activities from causing the quality of water to fail to meet water quality objectives established by the Ministry of Environment, Lands and Parks; provides that access locations must be greater than 100 metres upslope from water intakes in community watersheds, unless otherwise authorized
  - Guide to Mineral Exploration Code Standards: published by the Ministry of Energy and Mines to assist those wishing to explore for minerals and coal in the province.
- *Range Act*, R.S.B.C. 1996, c. 396: governs the granting of grazing leases, licences and permits for Crown lands

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- Guidelines for Canadian Drinking Water Quality: developed by the Federal-Provincial Subcommittee on Drinking Water; used by provincial and territorial governments to establish their own measures of water quality; recommend limits for substances and conditions that affect the quality of drinking water; guidelines are applied at the discretion of local governments and regional health authorities, subject to any provincial limits. Currently, the only legislated provincial requirement in British Columbia is with respect to fecal and total coliform levels, pursuant to the *Safe Drinking Water Regulation*.

- *Canadian Environmental Protection Act*, R.S.1985, c. 16 (4th Supp.): regulates substances that have a deleterious effect on the environment.

- *Canada Water Act*, R.S. 1985, c. 11: enacted in 1970, this statute enables cooperation between levels of government relating to management of water resources; in particular, section 11 provides that the Minister may enter into agreements with one or more provincial governments to designate water quality management areas and provide for water quality management programs in those areas; this can include provincial waters where water quality management has become a matter of "urgent national concern".

- Water Use Plans: may be required by the Comptroller of Water Rights pursuant to the Water Act as a condition of a new water licence being issued, or if there is application to amend a licence, or in response to a perceived water use conflict. Licensees or other interested parties may also request that the Comptroller require a Water Use Plan; the plan is a technical document that sets out the conditions under which the licensees are to operate; advisory consultations take place to develop the plan, involving interested parties; Water Use Plans are to take into account multiple water uses.
- Watershed Assessment Procedure (WAP): pursuant to the Forest Practices Code, 2 years after designation as a "community watershed", a WAP must be done before a forest development plan will be approved – WAP's are also done every 2 years during the life of the forest development plan.
- Range Use Plans: required pursuant to the Forest Practices Code when range use is to take place in community watersheds.
- Commission on Resources and the Environment ("CORE") Plans and Land and Resource Management Plans ("LRMP"): coordinated by the Land Use Coordination Office, these plans set strategic directions regarding land use planning; planning teams work with government to select new protected areas and recommend land use zones for Crown land. Land use plans are now being developed or approved for more than 80% of the province.
- Integrated Watershed Management Plans ("IWMP"): local plans that address management issues within single watersheds, with input from the provincial government and local stakeholders. Development of IWMP's began prior to the Forest Practices Code - 10 were completed prior to 1995, and 12 are still under development.
- Community Watershed Roundtables: local working groups which provide technical opinions regarding Watershed Assessment Procedure recommendations. Formation of such roundtables are required as part of the forest development planning process established under the Forest Practices Code, and involve expert technical input only, no public consultation.

III – Summary of Government Work Plans and Lead Agencies

1. Assessment of opportunities for consumer and supplier representation in land and resource management plans – Land Use Coordination Office
2. Coordinating forestry land use practices with public health protection interests – Ministries of Health, Forests and Environment, Lands and Parks
3. Publish community-based watershed guidelines – Ministry of Environment, Lands and Parks, Water Management Branch
4. Conduct pilot mapping of water supply areas – Ministry of Environment, Lands and Parks, Water Management Branch and Kootenay Regional Office
5. Improve integration and access to water data – Ministry of Environment, Lands and Parks, Water Management Branch
6. Hand-off of strategic land use plans to elected or appointed officials – Land Use Coordination Office
7. Input to Provincial Health Officer's Annual Report – Provincial Health Officer, Ministry of Health, Ministry of Environment, Lands and Parks' Water Management Branch
8. Drinking-water guidelines – Ministry of Health
9. Evaluate rights of resource access – Ministry of Environment, Lands and Parks, Water Management Branch
10. Provincial reporting of inspections in community watersheds – Ministry of Forests
11. Develop Water Quality Objectives pursuant to the Forest Practices Code – Ministry of Environment, Lands and Parks, Water Management Branch, Habitat Branch and Regional Operations
12. Results-based monitoring in community watersheds – Ministry of Forests
13. Range provisions and risk from parasites – Ministry of Forests
14. Range Use Plan review – Ministry of Forests
15. Study effects of recreation on drinking-water sources – Ministry of Environment, Lands and Parks, Water Management Branch
16. Implement the Non-Point Source Water Pollution Action Plan – Ministry of Environment, Lands and Parks, Water Management Branch

17. Review Highway Environmental Assessment Process Manual – Ministry of Transportation and Highways, Ministry of Environment, Lands and Parks
18. Update Ministry of Transportation and Highways/Ministry of Environment, Lands and Parks Memorandum of Understanding to include spill reporting requirements – Ministry of Transportation and Highways, Ministry of Environment, Lands and Parks, and Ministry of Health
19. Agriculture (Fraser Valley) – Ministry of Environment, Lands and Parks, Regional Operations
20. Drinking-water impacts from septic tank systems – Ministry of Municipal Affairs, Ministry of Health
21. On-site sewage treatment model by-law and toolkit – Ministry of Environment, Lands and Parks, Water Management Branch
22. Expand observation well network – Ministry of Environment, Lands and Parks, Water Management Branch, and Ministry of Health
23. Enhance groundwater quality monitoring – Ministry of Environment, Lands and Parks
24. Amendment of Sanitary Regulation – Ministry of Health
25. Aquifer mapping and inventory program – Ministry of Environment, Lands and Parks, Water Management Branch
26. Waterworks operators' manual – Ministry of Health, Ministry of Environment, Lands and Parks, Ministry of Municipal Affairs
27. Environmental operators' certification (waterworks systems) – Ministry of Health, Ministry of Environment, Lands and Parks
28. Enhanced enforcement of the Safe Drinking Water Regulation – Ministry of Health

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